M3099GX/GH IMAGE SCANNER
OEM MANUAL

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Preface

This manual provides technical information required to use the original equipment manufacturing (OEM) M3099G image scanner. The manual is organized as shown below.

Chapter 1   Overview

Chapter 1 provides the scanner features, configuration, and operation.

Chapter 2   Specifications

Chapter 2 provides general, electrical, environmental, physical, and option specifications.

Chapter 3   Interface Specifications

Chapter 3 provides SCSI interface specifications.

Chapter 4   Basic Operation

Chapter 4 provides power switch operation, opening/closing the upper transport unit, operator panel arrangement and functions, messages, loading document, and replacement of parts.

Chapter 5   Error Processing and Recovery

Chapter 5 provides how to handles temporary errors and equipment errors and what the operator should do to recovery.

Chapter 6   Document Specification

Chapter 6 provides document specifications (size, type, limitations, grounding color area, drop-out color, and job separation sheet) for the scanner.

Chapter 7   Consumables and Accessories

Chapter 7 provides consumables and accessories.

Chapter 8   Cleaning

Chapter 8 provides cleaning locations and frequencies, cleaning tools, and procedures.

It is recommended that you thoroughly familiarize yourself with the contents of this manual before attempting to use the scanner. Operators in particular must have read Chapter 4, "Basic Operation."

Conventions

Special information, such as warnings, cautions are indicated as follows:

WARNING
A WARNING indicattes that personal injury may result if you do not follow a procedure correctly.

CAUTION
A CAUTION indicates that damage to the scanner may result if you do not follow a procedure correctly.

NOTICE
A NOTICE provides "how-to" tips or suggestions to help you perform a procedure correctly. NOTEs are particularly useful for first-time users.

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CHAPTER

1

OVERVIEW

This chapter provides scanner features, configuration, and operation.

Scanner Types

The M3099GX/GH is a very fast and highly functional image scanner developed for volume filing, using charge-coupled device (CCD) image sensors. This scanner, featuring duplex reading and high-quality image processing, read documents fed by an automatic document feeder (ADF).

Scanner types of M3099GH and M3099GX are shown in Table 1.1 and 1.2. Those types of the scanner is hereinafter referred to as "this scanner".

Table 1.1 Types of M3099GH

Type	500 sheets hopper		1000 sheets hopper	
	with IPC2		with IPC2	
Item	100V	200V	100V	200V
Maximum document size	A4/Letter/Legal			
Scanning · Simplex	80 PPM (A4, 200dpi, portate)			
Duplex	60 PPM (A4, 200dpi, portrate)			
Hopper capacity	500 sheets		1000 sheets	
Hight of the Scanner	470 mm		530 mm	
IPC2 (option)	Installed		Installed	
Input voltage	100V	200V	100V	200V
Appearance	Figure 1.1		Figure 1.2	

Table 1.2 Types of M3099GX

Type Item	1000 sheets hopper	
	with IPC2	
	100V	200V
Maximum document size	A3/Double letter	
Scanning Simplex	60 PPM (A4, 200dpi, portate)	
Duplex	50 PPM (A4, 200dpi, portrate)	
Hopper capacity	1000 sheets	
Hight of the Scanner	530 mm	
IPC2 (option)	Installed	
Input voltage	100V	200V
Appearance	Figure 1.2	
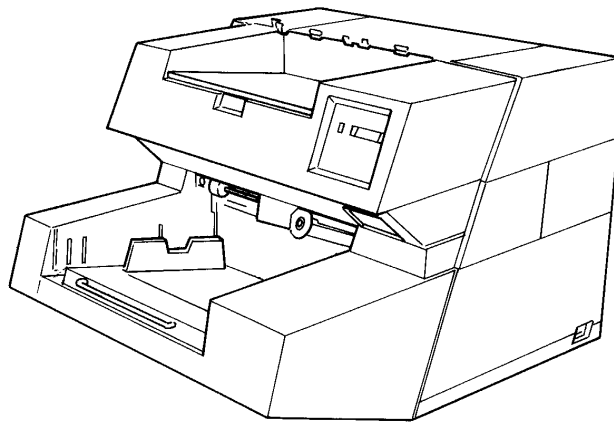
Figure 1.1 500 sheets hopper type
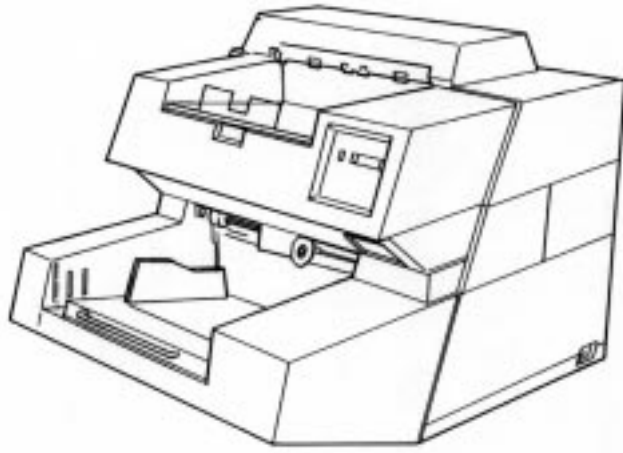
Figure 1.2 1000 sheets hopper type

Features   This scanner has the following features:

Duplex reading

Both sides of a document are read at the same time and their data transferred serially.

Fast reading

This scanner can read documents at high speed: 80 sheets/min (A4, 200dpi) in the simplex reading mode and 60 sheets/min (A4, 200dpi) in the duplex reading mode by M3099GH.

Large-capacity hopper

Up to 1000 sheets (A4, 55 kg) can be loaded on the hopper by the 1000 sheets hopper type.

High-quality image

This scanner uses a compact optical system that provides sharper focus. Furthermore, the use of new LSI chips produces finer images.

New image processing function

The error diffusion feature is provided as standard. Dithering or error diffusion can be applied to those areas judged to be photographs by automatic separation (image processing II option).

Configuration This section provides configuration and components of the scanner.

Configuration of the scanner

This scanner can be divided into two major sections, mechanism and control unit.

The mechanism unit consists of a hopper to load documents, automatic document feeder, upper and lower transport units to transport documents, a motor drive system, and an optical unit.

The control unit consists of an operator panel, a power supply, a mechanism driver to drive and control the mechanism unit, an image processing control, and an interface control.

Figure 1.3 shows scanner configuration.
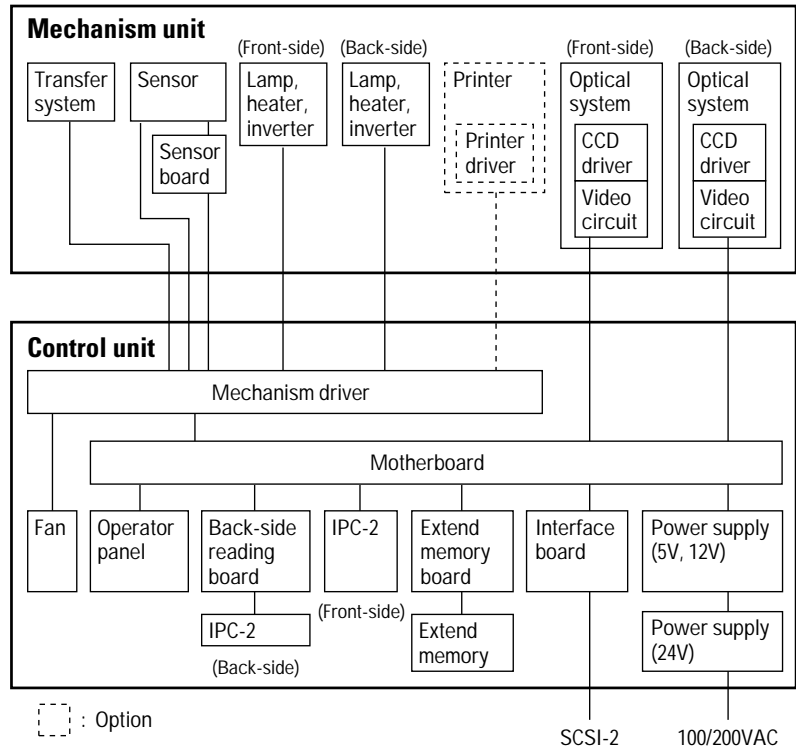
Figure 1.3 Scanner block diagram

Arrangement of units

Figure 1.4 shows arrangement of these units.

Power supply units

(+24V)

$\left(\begin{array}{c} +5V \\ \pm 12V \end{array}\right)$

Operator panel

Control unit

Stacker

Optical unit
(front-side)

Automatic document
feeder (ADF)

Power inlet

Hopper

Optical unit
(back-side)

Power switch
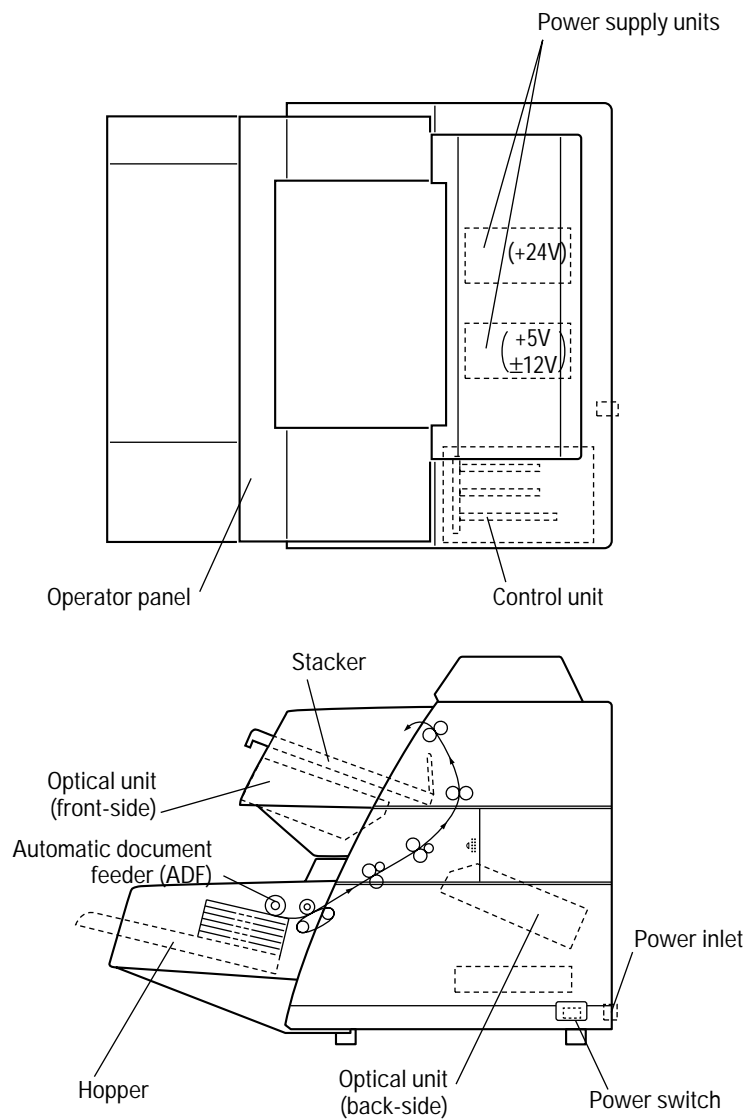
Figure 1.4 Arrangement of units

Operation Overview

This section outlines the operations of the mechanism and control units of the scanner.

Operation of the mechanism unit

The mechanism unit consists of two optical units (front and back sides), a hopper and ADF, upper and lower transport units, a motor drive system, and a stacker. Each optical unit consists of a CCD image sensor, a lens, and mirrors. The hopper and ADF feeds stacked documents and the upper and lower transport units transport the documents. The motor drive system drives these units. The stacker stores documents.

When the power is turned on, the lamps are lit and the scanner waits until the light intensities of the lamps become stable. Once the light intensities have become stable, the scanner is ready for a command from the host machine.

A document is picked from the hopper and then ADF feeds a document one by one. The document width is checked and document top is detected.

The documents are counted, fed, and stacked on the stacker.

The lamps illuminate the document, and a lens focuses the images on CCD for photoelectric conversion processing.

Operation of the control unit

The control unit consists of an operator panel, a power supply unit, mechanism driver, an image processing control, and an interface control.

This scanner has the following circuit configuration:
• Operator panel
• Control circuit (MPU)
• Video circuit (front-side/back-side)
• Interface circuit
• Duplex circuit (back-side)
• Motor driver circuit (including a stepper motor, a clutch driver)
• Power supply unit
• Image processing circuit (IPC II option)
• Memory board

Figure 1.5 shows control block diagram.
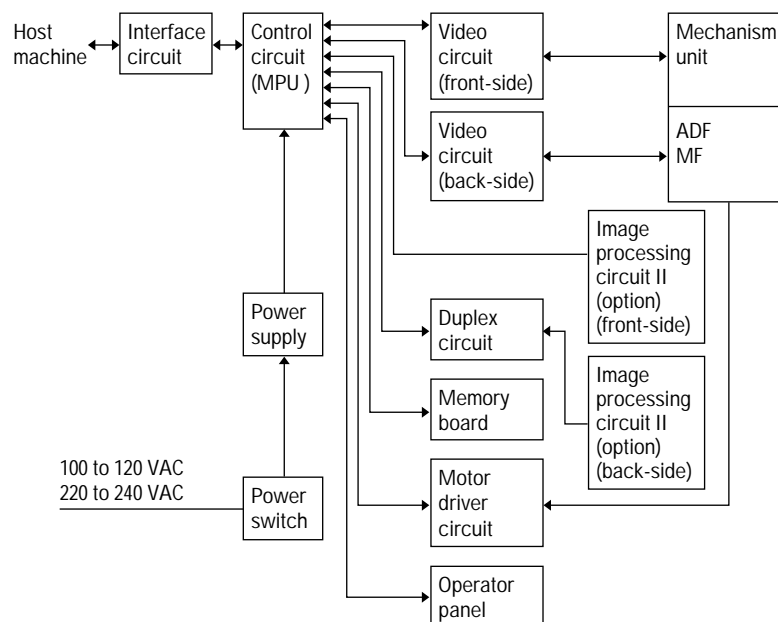
Figure 1.5 Control block diagram

Main control unit

This scanner is controlled by a 80C186 MPU. This scanner consists of a ROM as a program area, internal registers, an external RAM as a work area, gate arrays for the MPU peripheral and video circuits, dither processing and γ conversion RAMs, and error diffusion.

Interface control

SCSI-2 interface

SCSI (small computer system interface) circuit consists of SPC (MB86601A), VCEP (OTI95C71/20) and a glue ASIC. The scanned image data are transferred to interface circuit as video interface. The interface circuit converts internal video interface to SCSI interface via compression, if required. SCSI interface transferes data 1.5MB/s in Asynchronous transfer, 4.0MB/s in Synchronous transfer following to SCSI-2 standard. The VCEP compresses the binary image data in MH, MR, MMR algorithm defined by CCITT G3, G4. See Chapter 3 for details of SCSI interface.

Resolution

The basic resolution of this scanner is 200dpi. The resolution can be changed to 240, 300, or 400dpi from the host computer or the operator panel.

The resolution in the subscanning direction is achieved by changing the document transport speed.

When the image processing circuit II (IPC II) option is installed, the linear density is changed by setting the parameter to its internal circuit.

Video amplifier and driver section

This section consists of a CCD drive circuit, a video amplifier circuit, a white-black level correction circuit, sensors, and also control circuits for the stepping motor, heater, and lamps.

Image processing section

The IPC II option enables the following image processing functions:

- Automatic separation function (to read documents containing characters and photographs)
- Inversion function
- Mirror image output function
- Outline extraction function
- Overlay function
- Smoothing, filtering, and noise removing

Power supplies

This scanner has two power supplies. Their output voltages are as follows:

Power supply 1
- +5V: For logic circuits
- ±12V: For video amplifiers

Power supply 2
- 24V: For lamp, heater, and stepping motor drive

CHAPTER

2

SPECIFICATIONS

This chapter provides general, electrical, environmental, physical, and option specifications.

General

Table 2.1 list general scanner specifications.

Table 2.1 General scanner specifications

Type / Item		M3099GH		M3099GX
		500 sheets hopper	1000 sheets hopper	1000 sheets hopper
Sensor		CCD image sensor		
Scanning method		ADF (automatic document feeder) & MF (manual feeder)		
Document size	MAX.	216 × 356 mm (A4/Letter/Legal)		297 × 432 mm (A3/Double letter)
	MIN.	76 × 63 mm (3" × 2.5")		
Light source		Green fluorescent lamp		
Hopper/stacker capacity (64 g/m²)		MAX. 500 sheets	MAX. 1000 sheets	MAX. 1000 sheets
Gray scale (internal)		256 steps		
Output video		Binary/Halftone (64 levels)		
Scanning speed (A4, 200dpi, portrait)	Simplex	80 PPM		60 PPM
	Duplex	60 PPM		50 PPM
Output density		Standard: 400, 300, 240, 200dpi (Horizontal scanning and vertical scanning are independent.) If the image processing II (IPC2) is installed: 50 to 400 dpi (Horizontal scanning and vertical scanning are independent.)		
Binarization and halftone function		Standard: Fixed binarization, dither, error diffusion method. If the image processing II (IPC2) is installed: Automatic separation, image emphasis, outline extraction, mirror image, inversion, simplified DTC. Dynamic threshold, smoothing, filtering, nois removing.		
Interface		SCSI-2		

Electrical Specifications

Table 2.2 lists electrical specifications.

Table 2.2 Electrical specifications

Item		Specification
Input power	Voltage	100 to 120 VAC/220 to 240 VAC ±10%
	Phase	Single-phase
	Frequency	50/60 Hz +2%, –4%
Power consumption		0.25 kVA or less
Rush current		30 A or less
Momentary power failure		100%, 0.5 Hz
Leakage current		3.5 mA or less
Dielectric strength		DC 1.8 KV for one minute or more (between FG and AC lines)
AC line noise		Voltage 1.2 KV pulse duration 5 μs
Heat capacity		110 Kcal/H (440 BTU/H)

Environmental Specifications

Table 2.3 lists environmental specifications.

Table 2.3 Environmental specifications

Item		Specification	
Ambient conditions	Device status	Operating	Not operating
	Temperature	5 to 35°C	–20 to 60°C
	Humidity	20 to 80% (no condensation)	8 to 95% (no condensation)
Shock		0.2 G less	0.4 G or less
Stability		5° or less	10° or less
Acoustic noise		59 dBA or less (ISO 7779)	50 dBA or less (ISO 7779)
ESD		8 KV or more	

Physical Specifications

Figure 2.1 to Figure 2.2 show the scanner dimensions, Figure 2.3 shows scanner service areas. Table 2.4 lists physical specifications.

610

680

470
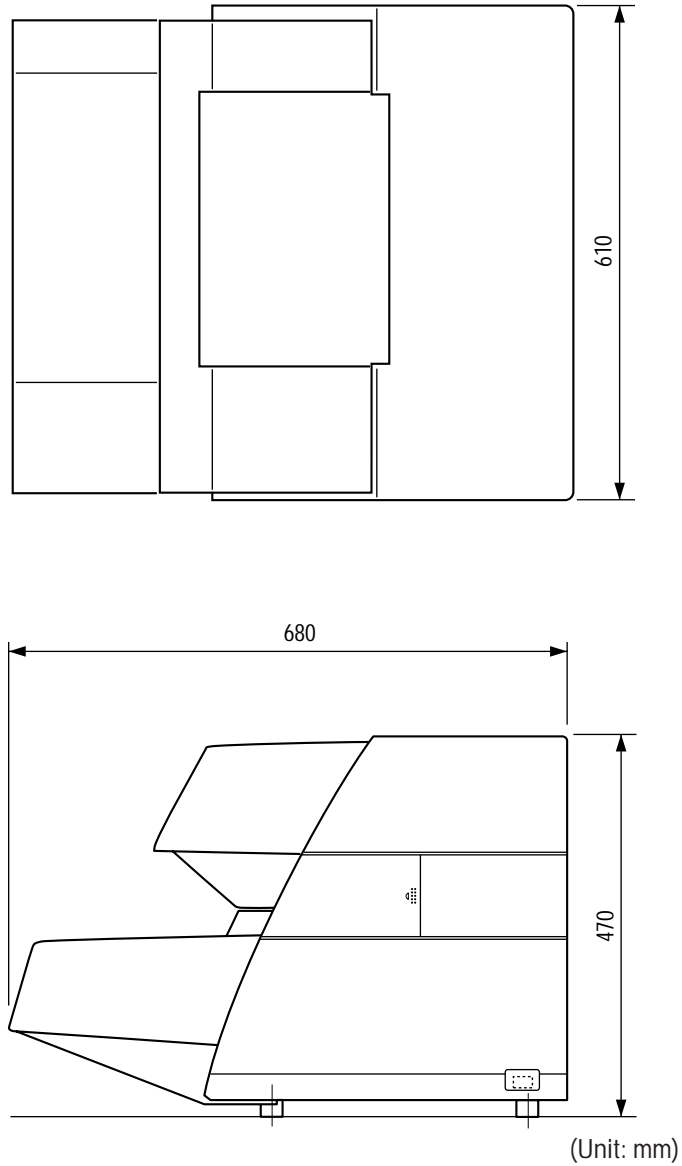
(Unit: mm)

Figure 2.1   Dimensions of 500 sheets hopper type

610

680

530
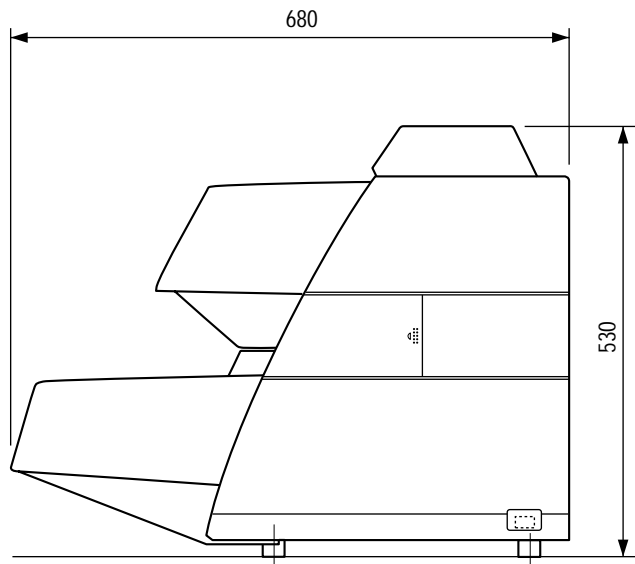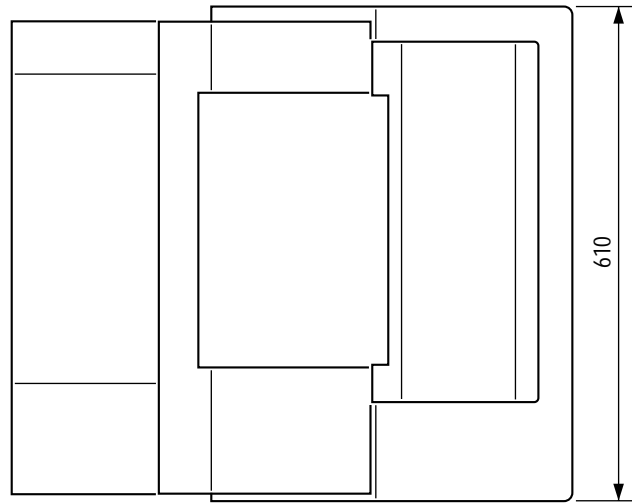
(Unit: mm)

Figure 2.2 Dimensions of 1000 sheets hopper type

Table 2.4 Physical specifications

Item	Type	500 sheets hopper type	1000 sheets hopper type
Dimensions	Width	610 mm	610 mm
	Depth	680 mm	680 mm
	Height	470 mm	530 mm
Weight		55kg	65kg

F: Front
(Unit: mm)
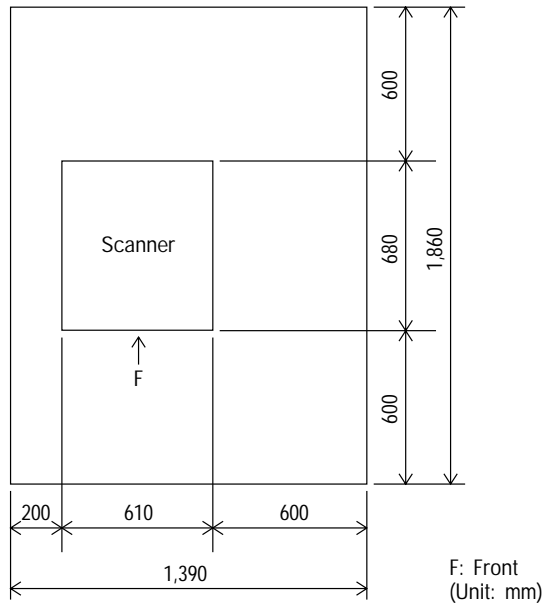
Figure 2.3 Service areas

Option Specifications

Table 2.5 lists the scanner option specifications.

Table 2.5 Option specifications

Item	Specification	Detail	Remark
Endorser	CA01023-D004	Ink-jet back-side print max. 20 characters	

INTERFACE

The M3099G image scanner provides SCSI-2(Small Computer System Interface-2) interface. The SCSI-2 is a 8 bit-parallel interface standardized by ANSI(American National Standard Institute).

This chapter provides an overview of the SCSI and interface specification of this scanner. For detail information, refer to ANSI SCSI standard document.

Definitions

- SCSI device: A host adapter or a target controller that can be attached to the SCSI bus.
- Initiator: An SCSI device that requests an I/O process to be performed by another SCSI device(a target).
- Target: An SCSI device that performes an operation requested by an initiator.
- Logical unit: A physical or virtual peripheral device addressable through a target.

Scope

This interface specification is following X3T9.2 draft proposal revision 10c. refering JBMS(Japan Business Machine Standard).

System configuration

This scanner operates under the multi-initiator, multi-target environment. An initiator function is not provided. This scanner incorporates an integrated target and logical unit (image scanner).

SCSI ID: 0 to 7(changeable), default 5.
Logical Unit Number (LUN):   000b(fixed).

Bus phases

All phases are supported

Commands
- INQUIRY
- OBJECT POSITION
- MODE SELECT(6)
- MODE SENSE(6)
- READ
- RELEASE UNIT
- REQUEST SENSE
- RESERVE UNIT
- SCAN
- SEND
- SEND DIAGNOSTIC
- SET WINDOW
- TEST UNIT READY
- ENDORSER (ENDORSER option is required)

Statuses
- BUSY
- CHECK CONDITION
- GOOD
- RESERVEATION CONFLICT

Messages
- ABORT
- BUS DEVICE RESET
- COMMAND COMPLETE
- DISCONNECT
- IDENTIFY
- INITIATOR DETECTED ERROR
- MESSAGE PARITY ERROR
- MESSAGE REJECT

- NO OPERATION
- RESTORE POINTERS
- SAVE DATA POINTER
- SYNCHRONOUS DATA TRANSFER REQUEST

Physical Specifications

Connection

SCSI devices are daisy-chaned together using a common 50-conductor 'A' cable and, optionally, a 68-conductor 'B' cable. Both ends of each cable are terminated. All signals are common between all SCSI devices on the 'A' cable. In systems that employ the wide SCSI option, wide SCSI devices additionally connect to the 'B' cable. Various width SCSI devices may be mixed. This scanner supports 'A' cable.

Note: Use of 'B' cable is not recommended because of ANSI draft proposal indicates this definition is removed in a future version of the SCSI.

SCSI device	SCSI device	SCSI device	SCSI device
TERMINATOR			TERMINATOR
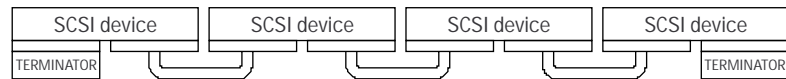
Figure 3.1   SCSI device connection

Physical specification

Table 3.1 SCSI physical specification

Item		Specification
Driver/receiver		Single Ended
Connector		50 Contact Shielded Low Density
Cable	Max. cable length	6 m
	Characteristic impedance	90 Ω to 140 Ω
	Cable type	25 signal twisted pair
	Stub length	≤ 0.1 m (from mainline)
Signal level	Terminator	See Figure. 3.2
	Driver/receiver	Open collector or three states driver

	Output characteristics:
	  Low-level output voltage
	
	  High-level output voltage
		0.0 to 0.5 volts dc at 48mA sinking (signal assertion)
		2.5 to 5.25 volts dc (signal negation)

	Input characteristics :
	  Low level input voltage
	  High level input voltage
	  Low level input current
	  High level input current
	  Minimum input hysteresis
		0.0 to 0.8 volts dc
		2.0 to 5.25 volts dc
		-0.4 to 0.0mA at Vi=0.5 volts dc
		0.0 to 0.1mA at Vi=2.7 volts dc
		0.2 volts dc

Connector pin assignments for signal lines		See Table 3.2

Termination

All signals not defined as RESERVED, GROUND, or TERMPWR shall be terminated at both ends of the cable. The Implementor may choose one of the following two methods to terminate each end (see ANSI SCSI-2 ANSI SCSI-2 5.4 Electrical description):

Single-ended alternative (a) [Passive terminator]

TERMINATOR POWER

−SIGNAL   220 Ω

GROUND   330 Ω
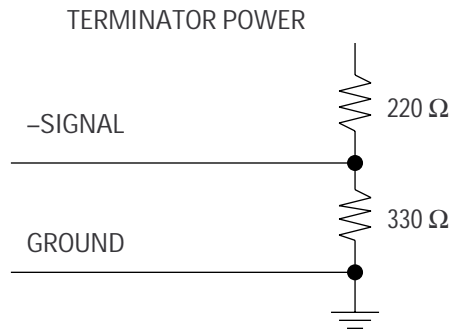
Figure 3.2 Alternative 1 termination for Single Ended Devices

Single-ended alternative (b) [Active terminator]

Vin	Low dropout voltage regulater Imax ≥ 600mA Vout = 2.85V (See Note 1)	Vout
	Vadj	

Component	Description
R1	121 Ω, 1%, 0.25W
R2	154 Ω, 1%, 0.25W
R3-R20	110 Ω, 1%
C1	10 µF Alum.15V or 4.7 µF Tant. 15V
C2	150 µF Alum.10V or 22 µF Tant. 10V (ESR at 120 Hz < 4)
C3	0.1 µF Ceramic 25V

NOTES
 1 The voltage regulator shown is an adjustable type with Vref=1.25V. R1 and R2 were selected to provide approximately 10mA Iquiescent. The voltage regulator Vdropout shall be 1.25V or less at Imax.
 2 Alternative values that provide lower performance at somewhat lower cost use Vout 1%; R3–R20=100 Ω,2%

Figure 3.3 Alternative 2 termination for Single Ended Devices

The first termination method above is the same as in SCSI-1. The second termination method is recommended for better signal quality.

Connector pin assignments

Table 3.2 Single Ended Contact Assignment - 'A' Cable

Signal Name	Connector Contact Number Set 2	Cable Connector Number		Connector Contact Number Set 2	Signal Name
GROUND	1	1	2	26	-DB(0)
GROUND	2	3	4	27	-DB(1)
GROUND	3	5	6	28	-DB(2)
GROUND	4	7	8	29	-DB(3)
GROUND	5	9	10	30	-DB(4)
GROUND	6	11	12	31	-DB(5)
GROUND	7	13	14	32	-DB(6)
GROUND	8	15	16	33	-DB(7)
GROUND	9	17	18	34	-DB(P)
GROUND	10	19	20	35	GROUND
GROUND	11	21	22	36	GROUND
GROUND	12	23	24	37	RESERVED
OPEN	13	25	26	38	TERMPWR
GROUND	14	27	28	39	RESERVED
GROUND	15	29	30	40	GROUND
GROUND	16	31	32	41	-ATN
GROUND	17	33	34	42	GROUND
GROUND	18	35	36	43	-BSY
GROUND	19	37	38	44	-ACK
GROUND	20	39	40	45	-RST
GROUND	21	41	42	46	-MSG
GROUND	22	43	44	47	-SEL
GROUND	23	45	46	48	-C/D
GROUND	24	47	48	49	-REQ
GROUND	25	49	50	50	-I/O

Note: The minus sign next to a signal indicates active low.

The lines labeled RESERVED in the 'A' cable contact assignment tables shall be connected to ground in the bus terminator assemblies or in the end devices on the SCSI cable. The RESERVED lines should be open in the other SCSI devices, but may be connected to ground. The RESERVED lines in this scanner are opened.

SCSI Bus (See ANSI SCSI-2 4.5)

Communication on the SCSI bus is allowed between only two SCSI devices at any given time. There is a maximum of eight SCSI devices. Each SCSI device has an SCSI ID bit assigned as shown in Figure 3.4.

	DB(7)	DB(6)	DB(5)	DB(4)	DB(3)	DB(2)	DB(1)	DB(0)
SCSI ID	ID=7	ID=6	ID=5	ID=4	ID=3	ID=2	ID=1	ID=0

Figure 3.4 DATA BUS

SCSI Bus Signals (See ANSI SCSI-2 4.6)

Table 3.3 SCSI Bus Signals

Signal	Description
BSY(BUSY)	An "OR tied" signal that indicates that the bus is being used.
SEL(SELECT)	An "OR tied" signal used by an initiator to select a target or by a target to reselect an initiator.
C/D (CONTROL/DATA)	A signal driven by a target that controls the direction of data movement on the DATA BUS with respect to an initiator. True indicates input to the initiator. This signal is also used to distiguish between SELECTION and RESELECTION phase.
MSG(MESSAGE)	A signal driven by a target during the MESSAGE phase.
REQ(REQUEST)	A signal driven by a target on the A cable to indicate a request for an ACK information transfer handshake.
ACK (ACKNOWLEDGE)	A signal driven by an initiator on the A cable to indicate an acknowledgement for a REQ information transfer handshake.
ATN(ATTENTION)	A signal driven by an initiator to indicate the ATTENTION condition.
RST(RESET)	An "OR tied" signal that indicates the RESET condition.
DB(7-0,P) (DATA BUS)	Eight data bit signals, plus a parity bit signal that from a DATA BUS. DB(7) is most significant bit and has the highest priority during the ATTENTION phase. Bit number, significance and priority decrese downward to DB(0). A data bit is defined as one when the signal value is true and is defined as zero when the signal value is false. Data parity DB(P) shall be odd. Parity is undefined during the ARBITRATION phase.

Signal Values

Signals may assure true or false values. These are two methods of driving these signals. In both cases, the signal shall be actively driven true, or asserted. In the case of OR tied drivers, the driver does not drive the signal to the false state, rather the bias circuitry of the bus terminators pulls the signal false whenever it is released by the drivers at every SCSI device. If any driver is asserted, then the signal is true. In the case of non OR tied drivers, the signal may be actively driven false. In this standard, whenever the term negated is used, it means that the signal may be actively driven false, or may be simply released (in which case the bias circuitry pulls it false), at the option of the implementor.

Signal Source

Table 3.4. indicates which type of SCSI device is allowed to source each signal. No attempt is made to show if the source is driving asserted driving negated, or is passive. All SCSI device drivers that are not active sources be in the passive state. The RST signal may be asserted by any SCSI device at any time.

Table 3.4 Signal Source

Bus Phase	BSY	SEL	C/D, I/O, MSG, REQ	ACK, ATN	DB(7,0) DB(P)
BUS FREE	None	None	None	None	None
ARBITRATION	All	Win	None	None	S ID
SELECTION	I&T	Init	None	Init	Init
RESELCTION	I&T	Targ	Targ	Init	Targ
COMMAND	Targ	None	Targ	Init	Init
DATA IN	Targ	None	Targ	Init	Targ
DATA OUT	Targ	None	Targ	Init	Init
STATUS	Targ	None	Targ	Init	Targ
MESSAGE IN	Targ	None	Targ	Init	Targ
MESSAGE OUT	Targ	None	Targ	Init	Init

All: The signal shall be driven by all SCSI devices that are actively arbitrating.

S ID: A unique data bit (the SCSI ID) shall be driven by each SCSI device that is actively arbitrating; the other seven data bits shall be released (i.e., not driven) by this SCSI device. The parity bit (DB(P)) may be released or driven to the true state, but shall never be driven to the false state during this phase.
The signal shall be driven by the initiator, target or both, as specified in the SELECTION phase and RESELECTION phase.

Init: If driven, this signal shall be driven only by the active initiator.

None: The signal shall be released; that is, not be driven by any SCSI device. The bias circuitry of the bus terminators pulls the signal to the false state.

Win: The signal shall be driven by the one SCSI device that wins arbitration.

Targ: If the signal is driven, it shall be driven only by the active target.

SCSI Bus Timing

Unless otherwise indicated, the delay time measurements for each SCSI device, shown in Table 3.5., shall be calculated from signal conditions existing at that SCSI device's own SCSI bus connection. Thus, these measurements (except cable skew delay) can be made without considering delays in the cable. The timing characteristics of each signal are described in the following paragraphs.

Table 3.5 SCSI Bus Timing Values

Timing Description	Timing Values
Arbitration Delay	2.4 μs
Assertion Period	90 ns
Bus Clear Delay	800 ns
Bus Free Delay	800 ns
Bus Set Delay	1.8 μs
Bus Settle Delay	400 ns
Cable Skew Delay	10 ns
Data Release Delay	400 ns
Deskew Delay	45 ns
Disconnection Delay	200 μs
Hold Time	45 ns
Negation Period	90 ns
Power-On to Selection Time	10 s recommended
Reset to Selection Time	25 μs
Reset Hold Time	200 μs
Selection Abort Time	200 μs
Selection Time-out Delay	250 ms recommended
Transfer Period	set during an SDTR message

Arbitration Delay

The minimum time an SCSI device shall wait from asserting BSY for arbitration until the DATA BUS can be examined to see if arbitration has been won. There is no maximum time.

Assertion period

The minimum time that a target shall assert REQ (or REQB) while using synchronous data transfers. Also, the minimum time that an initiator shall assert ACK (or ACKB) while using synchronous data transfers. REQB and ACKB timings only apply to optional wide data transfers.

Bus Clear Delay

The maximum time for an SCSI device to stop driving all bus signals after:

- The BUS FREE phase is detected.
- SEL is received from another SCSI device during the ARBITRATION phase.
- The transition of RST to true.

For the first condition above, the maximum time for an SCSI device to clear the bus is 1200 nanoseconds from BSY and SEL first becoming both false. If an SCSI device requires more than a bus settle delay to detect BUS FREE phase, it shall clear the bus within a bus clear delay minus the excess time.

Bus Free Delay

The minimum time that an SCSI device shall wait from its detection of the BUS FREE phase until its assertion of BSY when going to the ARBITRATION phase.

Bus Set Delay

The maximum time for an SCSI device to assert BSY and its SCSI ID bit the DATA BUS after it detects BUS FREE phase for the purpose of entering the ARBITRATION phase.

Bus Settle Delay

The minimum time for wait for the bus to settle after changing certain control signals as called out in the protocol definitions.

Cable Skew Delay

The maximum difference in propergation time allowed between any two SCSI bus signals measured between any two SCSI devices.

Data Release Delay

The maximum time for an initiator to release the DATA BUS signals following the transition of the I/O signals from false to true.

Deskew Delay

The minimum time required for deskew of certain signals.

Disconnection Delay

The minimum time that a target shall wait after releasing BSY before participating in an ARBITRATION phase when honoring a DISCONNECT message from the initiator.

Hold Time

The minimum time added between the assertion of REQ(or REQB) or ACK(or ACKB) and the changing of the data lines to provide hold time in the initiator or target while using synchronous data transfers. REQB and ACKB timings only apply to optional wide data transfers.

Negation Period

The minimum time that a target shall negate REQ (or REQB) while using synchronous data transfers. Also, the minimum time that an initiator shall negate ACK (or ACKB) while using synchronous data transfers. REQB and ACKB timings only apply to optional wide data transfers.

Power-On to Selection Time

The recommended maximum time from power application until an SCSI target is able to respond with appropriate status and sense data to the TEST UNIT READY, INQUIRY, and REQUEST SENSE commands.

Reset to Selection Time

The recommended maximum time after a hard RESET condition until an SCSI target is able to respond with appropriate status and sense data to the TEST UNIT READY, INQUIRY, and REQUEST SENSE commands.

Reset Hold Time

The minimum time for which RST is asserted. There is no maximum time.

Selection Abort Time

The maximum time that a target (or initiator) shall take from its most recent detection of being selected (or reselected) until asserting a BSY response. This time-out is required to ensure that a target (or initiator) does not assert BSY after a SELECTION (or RESELECTION) phase has been aborted. This is not the selection time-out period; see ANSI SCSI-2 6.1.3.1. and ANSI SCSI-2 6.1.4.2. for a complete description.

Selection Time-out Delay

The minimum time that a SCSI device should wait for a BSY response during the SELECTION or RESELECTION phase before starting the time-out procedure. Note that this is only a recommended time period.

Transfer Period

The Transfer Period specifies the minimum time allowed between the leading edges of successive REQ pulses and of successive ACK pulses while using synchronous data transfers. (See ANSI SCSI-2 6.1.5.2 and ANSI SCSI-2 6.6.21.)

SCSI Bus Phases   The SCSI architecture includes eight distinct phases:

a) BUS FREE phase
b) ARBITRATION phase
c) SELECTION phase
d) RESELECTION phase
e) COMMAND phase
f) DATA phase   These phases are collectively termed
g) STATUS phase   the information transfer phase.
h) MESSAGE phase

The SCSI bus can never be in more than one phase at any given time. In the following descriptions signals that are not mentioned shall not be asserted.

BUS FREE Phase (See ANSI SCSI-2 6.1.1 for details)

The BUS FREE phase indicates that there is no current I/O process and that the SCSI bus is available for a connection.

SCSI devices shall detect the BUS FREE phase after the SEL and BSY signals are both false for at least a bus settle delay.

SCSI devices shall release all SCSI bus signals within a bus clear delay after the BSY and SEL signals become continuously false for a bus settle delay. If an SCSI device requires more than a bus settle delay to detect the BUS FREE phase then it shall release all SCSI bus signals within a bus clear delay minus the excess time to detect the BUS FREE phase. The total time to clear the SCSI bus shall not exceed a bus settle delay plus a bus clear delay.

If an initiator detects the release of the BSY signal by the target at any other time, the target is indicating an error condition to the initiator. The target may perform this transition to the BUS FREE phase independent of the state of the ATN signal. The initiator shall manage this condition as an unsuccessful I/O process termination. The target terminates the I/O process by clearing all pending data and status information for the affected nexus. The target may optionally prepare sense data that may be retrieved by a REQUEST SENSE command.

ARBITRATION Phase

The ARBITRATION phase allows one SCSI device to gain control of the SCSI so that it can initiate or resume an I/O process.

The procedure for an SCSI device to obtain control of the SCSI bus is as follows:

a) The SCSI device shall first wait for the BUS FREE phase to occur. The BUS FREE phase detected whenever both the BSY and SEL signals are simultaneously and continuously false for a minimum of a bus settle delay.

b) The SCSI device shall wait a minimum of a bus free after detection of the BUS FREE phase (i.e. after the BSY and SEL signals are both false for a bus settle delay) before driving any signal

c) 3)Following the bus free delay in Step(b), the SCSI device may arbitrate for the SCSI bus by asserting both the BSY signal and its own SCSI ID, however the SCSI device shall not arbitrate (i.e. assert the BSY signal and its SCSI ID) if more than a bus settle delay has passed since the BUS FREE phase was last observed.

d) After waiting at least an arbitration delay (measured from its assertion of the BSY signal) the SCSI device shall examine the DATA BUS. If a higher priority SCSI ID bit is true on the DATA BUS (DB(7) is the highest), then the SCSI devices has lost the arbitration and the SCSI device may release its signals and return to Step(a). If no higher priority SCSI ID bit is true on the DATA BUS, then the SCSI device has won the arbitration and it shall assert the SEL signal. Any SCSI device other than the winner has lost the arbitration and shall release the BSY signal and its SCSI ID bit within a bus clear delay after the SEL signal becomes true. An SCSI device that loses arbitration may return to Step(a).

e) The SCSI device that wins arbitration shall wait at least a bus clear delay plus a bus settle delay after asserting the SEL signal before changing any signals.

SELECTION Phase

The SELECTION phase allows an initiator to select a target for the purpose of initiating some target function (e.g., READ or WRITE command). During the SELECTION phase the I/O signal is negated so that this phase can be distinguished from the RESELECTION phase.

The SCSI device that won the arbitration has both the BSY and SEL signals asserted and has delayed at least a bus clear delay plus a bus settle delay before ending the ARBITRATION phase. The SCSI device that won the arbitration becomes an initator by not asserting the I/O signal.

The initiator shall set the DATA BUS to a value which is the OR of its SCSI ID bit and the target's SCSI ID bit and it shall assert the ATN signal (indicating that a MESSAGE OUT phase is to follow the SELECTION phase). The initiator shall the wait at least two deskew delays and release the BSY signal. The initiator shall then wait at least a bus settle delay before looking for a response from the target.

The target shall not respond to selection if bad parity is detected. Also, if more than two SCSI ID bits are on the DATA BUS, the target shall not respond to selection.

No less than two deskew delays after the initiator detects the BSY signal is true, it shall release the SEL signal and may change the DATA BUS. The target shall wait unitl the SEL signal is false before asserting the REQ signal to enter an information transfer phase. (See ANSI SCSI-2 6.1.3.1 SELECTION Time-out Procedure)

RESELECTION Phase

RESELCTION is an optional phase that allows a target to reconnect to an initiator for the purpose of continuing some operation that was previously started by the initiator but was suspended by the target(i.e., the target disconnected by allowing a BUS FREE phase to occur before the operation was completed).

RESELECTION

Upon completing the ARBITRATION phase, the winning SCSI device has both the BSY and SEL signals asserted and has delayed at least a bus clear delay plus a bus settle delay. The winning SCSI device becomes a target by asserting the I/O signal. The winning SCSI device shall also set the DATA BUS to a value that is the logical OR of its SCSI ID bit and the initiator's SCSI ID bit. The target shall wait at least two deskew delays and release the BSY signal. The target shall wait at least a bus settledelay before looking for a response from the initiator.

The initiator shall determine that it is reselected when the SEL and I/O signals and its SCSI ID bit are true and the BSY signal is false for at least a bus settle delay. The reselected initiator may examine the DATA BUS in order to determine the SCSI ID of the reselecting target. The reselected initiator shall then assert the BSY signal within a selection abort time of its most recent detection of being reselected; this is required for correct operation of the time-out procedure. The initiator shall not respond to a RESELECTION phase if bad parity is detected.

Also, the initiator shall not respond to a RESELECTION phase if other than two SCSI ID bits are on the DATA BUS.

After the target detects the BSY signal is true, it shall also assert the BSY signal and wait at least two deskew delays and then release the SEL signal. The target may then change the I/O signal and the DATA BUS. After the reselected initiator detects the SEL signal is false, it shall release the BSY signal. The target shall continue asserting the BSY signal until it relinquished the SCSI bus. (See ANSI SCSI-2 6.1.4.2. RESELECTION Time-out Procedure)

Information Transfer Phases

NOTE: The COMMAND, DATA, STATUS, and MESSAGE phases are all grouped together as the information transfer phases because they are all used to transfer data or control information via the DATA BUS. The actual content of the information is beyond the scope of this section.

The C/D, I/O, and MSG signals are used to distinguish between the different information transfer phases(see Table 3.6). The target drives these three signals and therefore controls all changes from one phase to another. The initiator can request a MESSAGE OUT phase by asserting the ATN signal, while the target can cause the BUS FREE phase by releasing the MSG, C/D, I/O, and BSY signals.

The information transfer phases use one or more REQ/ACK handshakes to control the information transfer. Each REQ/ACK handshake allows the transfer of one byte of information. During the information transfer phases the BSY signal shall remain true and the SEL signal shall remain false. Additionally, during the inforamtion transfer phases, the target shall continuously envelope the REQ/ACK handshake(s) with the C/D, I/O, and MSG signals in such a manner that these control signals are valid for a bus settle delay before the assertion of the REQ signal of the first handshake and remain valid until after the negation of the ACK signal at the end of the handshake of the last transfer of the phase.

Table 3.6 Information Transfer Phases

Signal			Phase Name	Direction of Transfer	Comment
MSG	**C/D**	**I/O**			
0	0	0	DATA OUT	Initiator to target	Data
0	0	1	DATA IN	Initiator from target	Phase
0	1	0	COMMAND	Initiator to target	
0	1	1	STATUS	Initiator from target	
1	0	0	*		
1	0	1	*		
1	1	0	MESSAGE OUT	Initiator to target	Message
1	1	1	MESSAGE IN	Initiator to target	Phase
Key: 0 = False, 1 = True, * = Reserved for future standardization					

Asynchronous Information Transfer

The target shall control the direction of information transfer by means of the I/O signal. When the I/O signal is true, information shall be transferred from the target to the initiator. When the I/O signal is false, information shall be transferred from the initiator to the target. If the I/O signal is true (transfer to the initiator), the target shall first drive the DB(7-0,P) signals to their desired values, delay at least one deskew delay plus a cable skew delay, then assert the REQ signal. The DB(7-0,P) signals shall remain valid until the ACK signal is true at the target. The initiator shall read the DB(7-0,P) signals after the REQ signal is true, then indicate its acceptance of the data by asserting the ACK signal. When the ACK signal becomes true at the target, the target may change or release the DB(7-0,P) signals and shall negate the REQ signal. After the REQ signal is false the initiator shall then negate the ACK signal. After the ACK signal is false the target may continue the transfer by dividing the DB(7-0,P) signals and asserting the REQ signal, as described above.

If the I/O signal is false (transfer to the target) the target shall request information by asserting the REQ signal. The initiator shall drive the DB(7-0,P) signals to their desired values, delay at least one deskew delay plus a cable skew delay and assert the ACK signal. The initiator shall continue to drive the DB(7-0,P) signals until the REQ signal is false. When the ACK becomes true at the initiator, the initiator may change or release the DB(7-0,P) signals and shall negate the ACK signal. After the ACK signal is false the target may continue the transfer by asserting the REQ signal, as described above.

Synchronous Data Transfer

Synchronous data transfer is optional and is only used data phases. It shall be used in a data phase if a synchronous data transfer agreement has been established (see SYCHRONOUS DATA TRANSFER REQUEST Message). The agreement specifies the REQ/ACK offset and the minimum transfer period.

The REQ/ACK offset specifies the maximum number of REQ pulses that can be sent by the target in advance of the number of ACK pulses received from initiator, establishing a pacing mechanism. If the number of REQ pulses exceeds the number of ACK pulses by the REQ/ACK offset, the target shall not assert the REQ signal until after the leading edge of the next ACK pulse is received. A requirement for successful completion of the data phase is that the number of ACK and REQ pulses be equal.

The target shall assert the REQ signal for a minimum of an assertion period. The target shall then wait at least the greater of a transfer period from the last transition of the REQ signal to true or a minimum of a negation period from the last transition of the ACK signal to false before asserting the ACK signal.

The initiator shall send one pulse on the ACK signal for each REQ pulse received. The ACK signal may be asserted as soon as the leading edge of the corresponding REQ pulse has been received. The Initiator shall assert the ACK signal for a minimum of an assertion period. The initiator shall wait at least the greater of transfer period from the last transition of the ACK signal to true or for a minimum of a negation period from the last transition of the ACK signal to false before asserting the ACK signal.

If the I/O signal is true (transfer to the initiator), the target shall first drive the DB(7-0,P) signals to their desired values, wait at least one deskew delay plus one cable skew delay, then assert the REQ signals. The DB(7-0,P) signals shall be held valid for a minimum of one deskew delay plus one cable skew delay plus one hold time after the assertion of the REQ signal. The target shall assert the REQ signal for a minimum of an assertion period. The target may then negate the REQ signals within one hold time of the transition of the REQ signal to true. The initiator shall then respond with an ACK pulse.

If the I/O signal is false (transfer to the target), the initiator shall tranfer one byte for each REQ pulse received. After receiving the leading edge of a REQ pulse, the initiator shall first drive the DB(7-0,P) signals to their desired values, delay at least one deskew delay plus one cable skew delay, then assert the ACK signal. The initiator shall hold the DB(7-0,P) signals valid for at least one deskew delay plus one cable skew delay plus one hold time after the assertion of the ACK signal. The initiator shall assert the ACK signal for a minimum of an assertion period. The initiator may then negate the ACK signal and may one hold time of the transition of the ACK signal to true.

COMMAND Phase

The COMMAND phase allows the target to request command information from the initiator.

The target shall assert the C/D signal and negate the I/O and MSG signals during the REQ/ACK handshake(s) of this phase.

Data Phase

The data phase is a term that encompasses both the DATA IN phase and the DATA OUT phase.

DATA IN Phase

The DATA IN phase allows the target to request that data be sent to the initiator from the target.

The target shall assert the I/O signal and negate the C/D and MSG signals during the REQ/ACK handshake(s) of this phase.

DATA OUT Phase

The DATA OUT phase allows the target to request that data be sent from the target to the initiator.

The target shall negate the C/D, I/O, and MSG signals during the REQ/ACK handshake of this phase.

STATUS Phase

The STATUS phase allows the target to request that status information be sent from the target to the initiator.

The target shall assert the C/D and I/O signals and negate the MSG signal during the REQ/ACK handshake of this phase.

Message Phase

The message phase is a term that references either a MESSAGE IN, or a MESSAGE OUT phase. Multiple messages may be sent during either phase. The first byte transferred in either of these phases shall be either a single-byte message or the first byte of a multiple-byte message. Multiple-byte messages shall be wholly contained within a single message phase.

MESSAGE IN Phase

The MESSAGE IN phase allows the target to request that message(s) be sent to the initiator from the target.

The target shall assert the C/D, I/O, and MSG signals during the REQ/ACK handshake(s) of this phase.

MESSAGE OUT Phase (See ANSI SCSI-2 6.1.9.2 for details)

The MESSAGE OUT phase allows the target to request that message(s) be sent from the initiator to the target. The target invokes this phase in response to the attention condition created by the initiator.

The target shall assent the C/D and MSG signals and negate the I/O signal during the REQ/ACK handshake(s) of this phase. The target shall handshake byte(s) in this phase until the ATN signal is negated, except when rejecting a message.

If the target receives all of the message byte(s) successfully (i.e., no parity errors), it shall indicate that it does not wish to retry by changing to any information transfer phase other than the MESSAGE OUT phase and transfer at least one byte. The target may also indicate that it has successfully received the message byte(s) by changing to the BUS FREE phase (e.g., ABORT or BUS DEVICE RESET messages).

SCSI Bus Conditions

The SCSI bus has two asynchronous conditions; the attention condtion. These conditions cause the SCSI device to perform ceratin actions and alter the phase sequence.

Attention Condition

The attention condition allows an initiator to inform a target that the initiator has a message ready. The target may get this message by performing a MESSAGE OUT phase.

The initiator creates the attention condition by asserting ATN at any time except during the ARBITRATION or BUS FREE phases.

The initiator shall negate the ATN signal at least two deskew delays before asserting the ACK signal while transferring the last byte transferred in a bus phase for the attention condition to be honored before transition to a new bus phase. Asserting the ATN signal later might not be honored until a later bus phase and then may not result in the expected action. See ANSI SCSI-2 6.2.1 for details.

Reset Condition

The reset condition is used to immediately clear all SCSI devices from the bus. This condition shall take precedence over all other phases and condtions. Any SCSI device may create the reset condition by asserting the RST signal for a minimum of a reset hold time.

All SCSI devices shall release all SCSI bus signals (except the RST signal) within a bus clear delay of the transition of the RST signal to true. The BUS FREE phase always the reset condition.

The effect of the reset condition on I/O processes which have not completed, SCSI device reservations, and SCSI device operation modes is determined by whether the SCSI device has implemented the hard reset alternative or the soft reset alternative (one of which shall be implemented) as defined in ANSI SCSI-2 6.2.2.1 and 6.2.2.2. The hard and soft reset alternative is implemented is provided in the SftRe bit of the INQUIRY data. This scanner supports Hard Reset alternative as below.

Hard Reset Alternative:
1) Clear all I/O process including queued I/O process.
2) Release all SCSI device reservations.
3) Return any SCSI device operation modes to their appropriate initial conditions, similar to those conditions that would be found after a normal power-on reset. MODE SELECT conditions shall be restored to their last saved values if saved values have been established. MODE SELECT conditions for which no values have been save shall be returned to their default values.
4) Unit attention condition shall be set.

Note: I/O process queuing in (1) and parameter saving in (3) are not supported in this scanner.

SCSI Bus Phases Sequences

The order in which phases are used on the SCSI bus follows a prescribed sequence.

The reset condition can abort any phase and is always followed by the BUS FREE phase. Also any other phase can be followed by the BUS FREE phase but many such instances are error conditions.

The additional allowable sequences shall be as shown in Figure 3.5. The normal progression is from the BUS FREE phase to ARBITRATION, from ARBITRATION to SELECTION or RESELECTION, and from SELECTION or RESELECTION to one or more of the information tranfer phases (COMMAND, DATA, STATUS, or MESSAGE). The final information transfer phase is normally the MESSAGE IN phase where a DISCONNECT, or COMMAND COMPLETE message is transferred, followed by the BUS FREE phase.
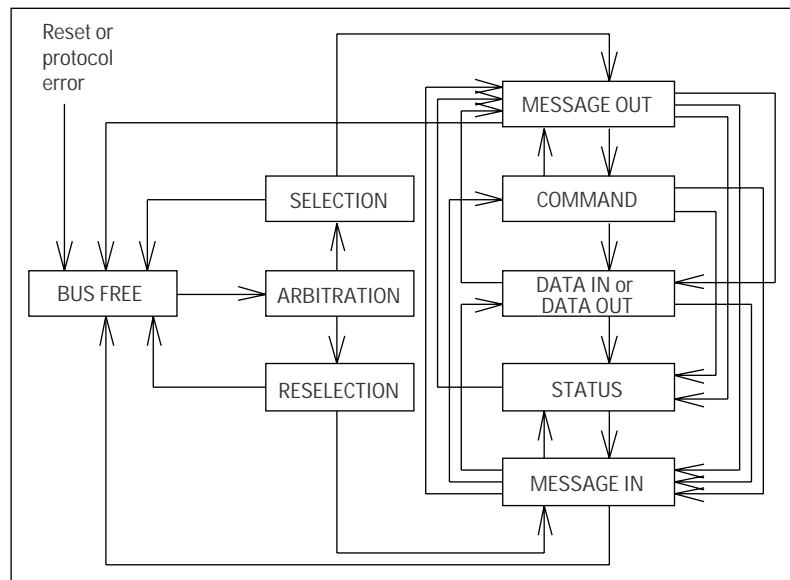
Figure 3.5 Phase Sequence

Commands (See ANSI SCSI-2 7)

A command is communicated by sending a command descriptor block to the target. For several commands, the command descriptor block is accompanied by a list of parameters sent during the DATA OUT phase. The command descriptor block always has an operation code as its first byte and a control byte as its last byte.

Reserved (See ANSI SCSI-2 7.1.1)

Reserved bits, fields, bytes, and code values are set aside for future standardization. Their use and interpretation may be specified by future extensions to ANSI SCSI standard. A reserved bit, field, or byte shall be set to zero, or in accordance with a future extension to this standard. A target that receives a reserved bit, field, or byte that is not zero or receives a reserved code value shall terminate the command with CHECK CONDITION status and the sense key shall be set to ILLEGAL REQUEST.

Logical Unit Number

The logical unit number is defined in the IDENTIFY message. The target shall ignore the logical unit number specified within the command descriptor block if an IDENTIFY message was received. This scanner supports Logical Unit Number 000b only. Followings shows target's response to selection of invalid logical unit.

- In response to an INQUIRY command, the target shall return the INQUIRY data with the peripheral qualifier set to the value required.
- In response to any other command except REQUEST SENSE, the target shall terminate the command with CHECK CONDITION status.
- In response to an REQUEST SENSE command, the target shall return sense data. The sense key shall be set to ILLEGAL REQUEST and the additional sense code shall be set to LOGICAL UNIT NOT SUPPORTED.

Transfer Length

The transfer length field specifies the amount of data to be transfered, usually number of blocks. The block length is this scanner is 1byte. In command that use multiple bytes for the transfer length, a transfer length of zero indicates that no data transfer shall take place. A value of one or greater indicates the number if blocks that shall be transferred.

Allocation Length

The allocation length field specifies the maximum number of bytes that an initiator has a allocated for returned data. An allocation length of zero indicates that no data shall be transferred. This condition shall not be considered as an error. The target shall terminate the DATA IN phase when allocation length bytes have been transferred or when all available data have been transferred to the initiator, whichever is less. The allocation length is used to limit the maximum amount of data(e.g. sense data, mode data, etc) returned to initiator.

Control field

The control field is the last byte of every command descriptor block. The control field is defined in ANSI SCSI-2 7.2.7. In this scanner, this field is not used. Any field in this byte is regarded as Reserved.

Table 3.7 Operation Code Types

Command	Operation Code(hex)	Description
RESERVE UNIT	16	Reserve a logical unit
RELEASE UNIT	17	Release a previously reserved logical unit
INQUIRY	12	Requests information regarding parameters of target and its attached peripheral device(s).
REQUEST SENSE	03	Requests the target transfer sense data to the initiator
SEND DIAGNOSTIC	1D	Request the target to perform diagnostic operations on itself
ENDORSER	C1	Start/Stop endorser function
TEST UNIT READY	00	Check if the logical unit is ready
SET WINDOW	24	Specify windows within the scanning range of the device.
SEND	2A	Transfers data from initiator to target
OBJECT POSITION	31	Provids positioning functions (ADF Feed in/out)
SCAN	18	Requests the target begin a scan operation
READ	28	Requests the target transfer data to the initiator
MODE SELECT(6)	15	Specify logical unit, peripheral device parameters from the initiator to the target
MODE SENSE(6)	1A	Report parameters from the target to the initiatot

RESERVE UNIT Command

The RESERVE UNIT command (Table 3.8) is used to reserve logical unit for the exclusive use of the requesting initiator to another specified SCSI device.

Table 3.8 RESERVE UNIT Command

Bit Byte	7	6	5	4	3	2	1	0
0	Operation Code (16h)							
1	Logical Unit Number			3rdPty	Third Party Device ID			Reserved
2	Reserved							
3	Reserved							
4	Reserved							
5	Control							

The RESERVE UNIT and RELEASE UNIT commands provide the basic mechanism for contention resolution in multiple-initiator systems.

This command requests that the entire logical unit be reserved for the exclusive use of the initiator until the reservation is superseded by another valid RESERVE UNIT command from the initiator that made the reservation or until released by a BUS DEVICE RESET message from any initiator, by a hard reset condition, or by a power on cycle. The reservation shall not be granted if the logical unit is reserved by another initiator. It shall be permissible for an initiator to reserved a logical unit that is currently reserved by that initiator.

If the logical unit is reserved for another initiator, the target shall return RESERVATION CONFLICT status.

    3rdPty: 0b (Reserved)
    Third Party Device ID: 000b (Reserved)

Superseding Reservations

An initiator that currntly has a logical unit reserved may modify the current reservation by issuing another RESERVE UNIT command to the same logical unit. The superseding reservation shall release the current reservation if the superseding reservation request is granted. If the superseding resrvation cannot be granted because of conflicts with a previous reservation (other than the current reservation), then the target shall return RESERVATION CONFLICT status.

See ANSI SCSI-2 9.2.10.2 for details.

RELEASE UNIT Command

The RELEASE UNIT command (Table 3.9) is used to release previously reserved logical units for the requesting initiator to another specified SCSI device.

Table 3.9 RELEASE UNIT Command

Bit Byte	7	6	5	4	3	2	1	0
0	Operation Code (17h)							
1	Logical Unit Number			3rdPty	Third Party Device ID			Reserved
2	Reserved							
3	Reserved							
4	Reserved							
5	Control							

The RESERVE UNIT and RELEASE UNIT commands provide the basic mechanism for contention resolution in multiple-initiator systems.

If a valid reservation exists for the I_T_L nexus, the target shall release the reservation and return GOOD status.

A reservation may only be released by the initiator that made it. It is not an error to attempt to release reservation that is currently valid or is held by another initiator. In this case, the target shall return GOOD status without altering any other reservation.

3rdPty: 0b (Reserved)
Third Party Device ID: 000b (Reserved)

TEST UNIT READY Command

The TEST UNIT READY command (Table 3.10) provides a means to check if the logical unit is ready. This is not a request for a selftest. If the logical unit would accept an appropriate command without returning CHECK CONDITION status, this command shall return a GOOD status. If the logical unit cannot become operational the target shall return CHECK CONDITION status with a sense key of NOT READY.

Table 3.10 TEST UNIT READY Command

Bit Byte	7	6	5	4	3	2	1	0
0	Operation Code (00h)							
1	Logical Unit Number			Reserved				
2	Reserved							
3	Reserved							
4	Reserved							
5	Control							

INQUIRY Command (See ANSI SCSI-2 7.2.5)

The INQUIRY command (Table 3.11) requests that information regarding parameters of the target and its attached peripheral device(s) be sent to the initiator. An option allows the inititor to request additional information about the target or logical unit (See ANSI SCSI-2 7.2.5.2 Vital Product Data).

Table 3.11 INQUIRY Command

Bit Byte	7	6	5	4	3	2	1	0
0	Operation Code (12h)							
1	Logical Unit Number			Reserved				EVPD
2	Page Code							
3	Reserved							
4	Allocation Length							
5	Control							

EVPD (Enable Vital Product Data):

This bit of one specifies that the target shall return the optional vital product data specified by the page code field. If the target does not support vital product data and this bit is set to one, the target shall return CHECK CONDITION status with the sense key set to ILLEGAL REQUEST and an additional sense code of INVALID FIELD IN CDB.

This bit of zero specifies that the target shall return the standard INQUIRY data. If the page code field not zero, the target shall return CHECK CONDITION status with the sense key set to ILLEGAL REQUEST and an additional sense code of INVALID FIELD IN CDB.

Page Code:

This field specifies which page of vital product data information the target shall return (see ANSI SCSI-2 7.3.4). The supported vital product data in this scanner is Page Code F0h.

The INQUIRY command shall return CHECK CONDITION status only when the target cannot return the requested INQUIRY data.

If an INQUIRY command is received from an initiator with a pending unit attention condition (i.e., before the target reports CHECK CONDITION status), the target shall perform the INQUIRY command and shall not clear the unit attention condition.

Standard INQUIRY Data (See ANSI SCSI-2 7.2.5.1)

This standard INQUIRY data (Table 3.12) contains 36 required bytes, followed by a variable number of vendor-specific parameters. Bytes 56 through 95, if returned, are reserved for future standardization.

Table 3.12 Standard INQUIRY Data Format

Bit Byte	7	6	5	4	3	2	1	0
0	Peripheral Qualifier			Peripheral Device Type				
1	RMB	Device-Type Modifier						
2	ISO Version		ECMA Version			ANSI Approved Version		
3	AENC	Reserved						
4	Additional Length (n-4)							
5	Reserved							
6	Reserved							
7	RelAdr	WBus32	WBus16	Sync	Linked	Reserved	CmdQue	SftRe
8 – – – 15	(MSB) – – –	Vendor Identification					– – – (LSB)	
16 – – – 31	(MSB) – – –	Product Identification					– – – (LSB)	
32 – – – 35	(MSB) – – –	Product Revision Level					– – – (LSB)	
36 – – – 55	Vendor Specific							
56 – – – 95	Reserved							
	Vendor-Specific Parameters							
96 – – – n	Vendor Specific							

The peripheral qualifier and peripheral device type fields identify the device currently connected to the logical unit. If the target is not capable of supporting a device on this logical unit, this field shall be set to 7Fh (peripheral qualifier set to 011b and peripheral device type set to 1Fh).

Peripheral Qualifier: 000b(Connected)

Peripheral Device Type: 06h(Scanner Device)

RMB(Removable Medium Bit): 0b(not supported).

Device Type Modifier: 0000000b(not supported)

ISO Version: 00b(does not claim compliance with ISO)

ECMA Version: 000b(does not claim compliance with ECMA)

ANSI Approved Version: 2h(SCSI-2, if approved)

AENC(Asynchronous Event Notification Capability):
                                   0b(Reserved)

TrmIOP(Terminate I/O Process):
                                   0b(not supported. see ANSI SCSI-2 5.6.22)

Response Data Format: 2h(INQUIRY Data Format is defined in SCSI-2)

Additional Length: 91(n=95)

This field shall specify the length in bytes of the parameters. If the allocation length of the command descriptor block is too small to transfer all of the parameters, the additional length shall not be adjusted to reflect the truncation.

RelAdr(Relative Addressing):   0b(not supported)

Wbus32(Wide Bus 32):   0b(not supported)

Wbus16(Wide Bus 16):   0b(not supported)

Sync(Synchronous Transfer):   1b(synchronous transfer supported)

Linked(Linked Command):   0b(not supported)

CmdQue(Command Queuing): 0b(not supported)

SftRe(Soft Reset):   0b(Hard Reset)

Vendor Identification: "FUJITSU "

Product Identification: (M3099GH)
"M3099GHdm   "   default (Duplex, CMP2 equivalent)
"M3099GHdem   "   with ENDORSER option
"M3099GHdim   "   with IPC2 option
"M3099GHdeim   "   with ENDORSER, IPC2 options

Product Identification: (M3099GX)
"M3099Gdm   "   default (Duplex, CMP2 equivalent)
"M3099Gdem   "   with ENDORSER option
"M3099Gdim   "   with IPC2 option
"M3099Gdeim   "   with ENDORSER, IPC2 options

Product Identification: (M3096G)
"M3096Gm   "   default
"M3096Gim   "   with IPC2 option

Product Revision Level: "01 "(Black and White Binary)

Vital Product Data

JBMS(Japanese Business Machines Standard) is defining standard
Vital Product Data. (See JBMS-40-1990) Fujitsu Scanners also
support this data by adding Fujitsu original extention. JBMS-40-
1990 uses 30 Bytes as standard VPD to describe specification and
functions.This data is obtained by setting EVPD bit to 1 and Page
Code to F0h in INQUIRY command.

If Product Identification has changed to M3096G or M3099G in
Off-line SETUP mode following data are returned. The 'd' which
indicates Duplex, and 'e' which indicates ENDORSER are not
returned. See Chapter 4 Operator panel.

Table 3.13 Standard VPD Page Format

Bit Byte	7	6	5	4	3	2	1	0
0	Peripheral Device Type							
1	Page Number(F0h)							
2	J Version							
3	Reserved							
4	Page Length (m-5)							
5	(MSB)			Basic X Resolution				(LSB)
6								
7	(MSB)			Basic Y Resolution				(LSB)
8								
9	Res Step X				Res Step Y			
10	(MSB)			Maximum X Resolution				(LSB)
11								
12	(MSB)			Maximum Y Resolution				(LSB)
13								
14	(MSB)			Minimum X Resolution				(LSB)
15								
16	(MSB)			Minimum Y Resolution				(LSB)
17								
18	(MSB)			Standard Resolution				(LSB)
19								
20	(MSB)			Window Width				(LSB)
23								
24	(MSB)			Window Length				(LSB)
27								
28	Function							
29	Reserved							
30 to n	Vendor Unique Parameter Byte(s)							

Peripheral Device: 06h(Image Scanner)
Page Number: F0h(Page Code)
J Version: 02h(JBMS 0.2)
Page Length: 95(m=100)
Basic X Resolution: 200(200dpi)
Basic Y Resolution: 200(200dpi)
Res Step X: 00h(Variable Resolution)
Res Step Y: 00h(Variable Resolution)
Maximum X Resolution: 400(400dpi with/without IPC2)
Maximum Y Resolution: 400(400dpi with/without IPC2)
Minimum X Resolution: 200(without IPC2)/50(with IPC2)
Minimum Y Resolution: 200(without IPC2)/50(with IPC2)
Standard Resolution: 01D0h(without IPC2)/FFF0h(with IPC2)

This field indicates available resolution bit is set as as described in Table 3.14. This is applied to only for main-scan direction.

Table 3.14 Standard Resolution (unit:Pixel/Inch)

Bit Byte	7	6	5	4	3	2	1	0
17	60	75	100	120	150	160	180	200
18	240	300	320	400	480	600	800	1200

Window Width: 00000980h(2432 dot) for M3099GX
                            000006C0h(1728dot) for M3099GH
Window Length: 00000D80h(3456 dot)

Window Width and Window Length fields are maximum width and length those are available by the scanner. The units are pixels counted by the basic resolution.

Function: 00000110b

Function field specifies functions supported by the scanner. Each bit is set to 1 corresponding to Table 3.15.

Table 3.15 Function

Bit	Description
Bit 0	Data Over Flow Scanners that will cause data over flow sets this bit to 1. Image scanners that will not cause data over flow set this bit to 0. Support of Start Switch is not specified.
Bit 1	Binary (Black and White) Scanners support Black and White set this bit to 1. Scanners do not support Black and White set this bit to 0.
Bit 2	Dither/Halftone Scanners support Dither/Halftone set this bit to 1. Scanners do not support Dither/Halftone set this bit to 0.
Bit 3	Grayscale Scanners support Grayscale set this bit to 1. Scanners do not support Grayscale set this bit to 0. Steps of gray is not specified.
Bit 4	Reserved (Bit 4 to 7 are Reserved in JBMS)
Bit 5	Binary (RGB Color) Scanners support (RGB Color) set this bit to 1. Scanners do not support (RGB Color) set this bit to 0.
Bit 6	Dither/Halftone(RGB Color) Scanners support Dither/Halftone (RGB Color) set this bit to 1. Scanners do not support Dither/Halftone (RGB Color)set this bit to 0.
Bit 7	Grayscale(RGB Color) Scanners support Grayscale(RGB Color) set this bit to 1. Scanners do not support Grayscale(RGB Color) set this bit to 0. Steps of gray is not specified.

*) Data Over Flow means when receipt of data by the initiator is too slow, data buffer of image scanner is filled and data is not guranteed.

Fujitsu further defines own Vital Product Data using Vendor Specific field of JBMS. This extended Vital Product Data is used by Device Driver to confirm which functions are supported. Current defined data is totally 100 bytes but it will be expanded by future functions.

Table 3.16 Standard VPD Page Extended Format

Bit Byte	7	6	5	4	3	2	1	0
30	Reserved							
31	Reserved							
32	(MSB)		Physical Function					
33								(LSB)
34	(MSB)		Buffering Capability					
37								(LSB)
38	(MSB)		Implemented Standard Command					
41								(LSB)
42			Implemented Vendor Specific Command					
49								
50			Implemented Vendor Unique Parameter					
81								
82			Image Control Function					
87								
88			Image Processing Function					
89								
90			Compression Function					
91								
92			Endorser Function					
93								
94			Barcode Function					
97								
95			Reserved					
100								

Physical Function: 10010010 00001000b(without
                                      ENDORSER)
                                      10011010 00001000b(with
                                      ENDORSER)

Physical Function field of each bit indicates Physical variated functions.

Table 3.17 Physical Function

Byte	Bit	Description
32	`1XXXXXXXb`	Automatic Document Feeder
	`X1XXXXXXb`	Flatbed
	`XX1XXXXXb`	Tranceparency
	`XXX1XXXXb`	Duplex
	`XXXX1XXXb`	Endorser
	`XXXXX1XXb`	Barcode
	`XXXXXX1Xb`	Operator Panel
	`XXXXXXX1b`	Reserved
33	`0000nnnnb`	Bits of ADC

Buffering Capability: 0080 0000h(8M Bytes)

Buffering Capability field indicates that interface buffering capability in bytes.

Implemented Standard Command:
                          0000 0000 0000 0000 1110 1101 1011
                          1111b = 0000EDBFh

Implemented Standard Command field of each bit indicates supported SCSI command as Table 3.18.

Table 3.18 Implemented Standard Command

Bit	Command	Code	
0	TEST UNIT READY	00h	M
1	REQUEST SENSE	03h	M
2	INQUIRY	12h	M
3	MODE SELECT(6)	15h	O
4	RESERVE UNIT	16h	M
5	RELEASE UNIT	17h	M
6	COPY	18h	O
7	MODE SENSE(6)	1Ah	O
8	SCAN	1Bh	O
9	RECEIVE DIAGNOSTIC RESULTS	1Ch	O
10	SEND DIAGNOSTIC	1Dh	M
11	SET WINDOW	24h	M
12	GET WINDOW	25h	O
13	READ	28h	M
14	SEND	2Ah	O
15	OBJECT POSITION	31h	O
16	GET DATA BUFFER STATUS	34h	O
17	COMPARE	39h	O
18	COPY AND VERIFY	3Ah	O
19	WRITE BUFFER	3Bh	O
20	READ BUFFER	3Ch	O
21	CHANGE DEFINITION	40h	O
22	LOG SELECT	4Ch	O
23	LOG SENSE	4Dh	O
24	MODE SELECT(10)	55h	O
25	MODE SENSE(10)	5Ah	O
26	Reserved		
27	Reserved		
28	Reserved		
29	Reserved		
30	Reserved		
31	Reserved		

INTERFACE

Implemented Vendor Specific Command:

   CXh = 0000h, DXh = 0000h, EXh = 0000h, FXh = 0000h
   (without ENDORSER)
   CXh = 0002h, DXh = 0000h, EXh = 0000h, FXh = 0000h
   (with ENDORSER)

Implemented Vendor Specific Command field indicates vendor specific command implemented by the scanner. This field consists of 4 sets of 2 bytes structure as Table 3.19. Each bit position in these fields indicates lower 4 bits of the command code.

Implemented Vendor Specific Command field is subdivided to CXh, DXh, EXh, FXh as Table 3.20.

Table 3.19 2 bytes structure

Bit Byte	7	6	5	4	3	2	1	0
0	bit 15	bit 14	bit 13	bit 12	bit 11	bit 10	bit 9	bit 8
1	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0

Table 3.20 Implemented Vendor Specific Command

Bytes	Description
42, 43	Vendor Specific Command field - CXh
44, 45	Vendor Specific Command field - DXh
46, 47	Vendor Specific Command field - EXh
48, 49	Vendor Specific Command field - FXh

Table 3.21 Implemented Vendor Specific Command

Field&Bit		Command	Code	
CXh	0	SET SUBWINDOW	C0h	V
	1	ENDORSER	C1h	V
DXh				
EXh				
FXh				

Vendor Unique Parameter: See Table 3.22

Vendor Unique Parameter field indicates supported Vendor Unique Parameter pages defined in SET WINDOW command. Vendor Unique Parameter field consists of 16 sets of 2 bytes structure as Table 3.22.Vendor Unique Parameter field are subdivided to fields 0Xh to FXh.

Table 3.22 Vendor Unique Parameter

Bytes	Description	Value
50, 51	Vendor Unique Parameter - 0Xh	0001h
52, 53	Vendor Unique Parameter - 1Xh	0000h
54, 55	Vendor Unique Parameter - 2Xh	0000h
56, 57	Vendor Unique Parameter - 3Xh	0000h
58, 59	Vendor Unique Parameter - 4Xh	0000h
60, 61	Vendor Unique Parameter - 5Xh	0000h
62, 63	Vendor Unique Parameter - 6Xh	0000h
64, 65	Vendor Unique Parameter - 7Xh	0000h
66, 67	Vendor Unique Parameter - 8Xh	0000h
68, 69	Vendor Unique Parameter - 9Xh	0000h
70, 71	Vendor Unique Parameter - AXh	0000h
72, 73	Vendor Unique Parameter - BXh	0000h
74, 75	Vendor Unique Parameter - CXh	0000h
76, 77	Vendor Unique Parameter - DXh	0000h
78, 79	Vendor Unique Parameter - EXh	0000h
80, 81	Vendor Unique Parameter - FXh	0000h

Image Control Function field indicates supplementary information on SET WINDOW arameter. Image Control Function field is subdivided to Brightness Steps, Threshold Steps, Contrast Steps, Number of resident Dither, Number of registrable Dither, Number of resident Gamma Function, Number of registrable Gamma Function as Table 3.23.

Brightness Step: FFh(255 steps)

Brightness Step field indicates available steps of the Brightness. If zero is pecified, Brightness Control is not supported.

Threshold Step: FFh(255 steps)

Threshold Step field indicates available steps of the Threshold. If zero is pecified, Threshold Control is not supported.

Contrast Step: FFh(255 steps)

Contrast Step field indicates available steps of the Contrast. If zero is pecified, Contrast Control is not supported.

Number of Resident Dither: 0100xxxxb(4 patterns)

Number of Resident Dither field indicates number of resident Dither patterns in 4 bits. If zero is specified no dither pattern is available.

Number of Registerable Dither: xxxx1000b(8 patterns)

Number of Registerable Dither field indicates registrable dither patterns in 4 bits. If zero is specified no dither pattern is registrable.

Number of Resident Gamma Function: 0100xxxxb(4 patterns)

Number of Resident Gamma Function field indicates number of resident gamma functions in 4 bits. If zero is specified no gamma function is available.

Number of Registrable Gamma Function: xxxx1000b(8 patterns)

Number of Registrable Gamma Function field indicates registrable gamma functions in 4 bits. If zero is specified no gamma function is registrable.

Table 3.23 Image Control Function

Byte	Bit	Description
82	**nnnnnnnnb**	Brightness Steps
83	**nnnnnnnnb**	Threshold Steps
84	**nnnnnnnnb**	Contrast Steps
85	**00000000b**	Reserved
86	**nnnnXXXXb**	Number of resident Dither
	XXXXnnnnb	Number of registrable Dither
87	**nnnnXXXXb**	Number of resident Gamma Function
	XXXXnnnnb	Number of registrable Gamma Function

Image Processing Function: 10000001 01000000b(without IPC2)
                                          11111111 01000000b(with IPC2)

Image Processing function field of each bit indicates supported
Image Processing function.

Table 3.24 Image Processing Function

Byte	Bit	Description
88	**1XXXXXXXb**	Reverse Image Format
	X1XXXXXXb	Dynamic Threshold Circuit
	XX1XXXXXb	Simplified DTC
	XXX1XXXXb	Outline Extract
	XXXX1XXXb	Image Emphasis
	XXXXX1XXb	Automatic Separation
	XXXXXX1Xb	Mirror Image
	XXXXXXX1b	White Level Follower
89	**1XXXXXXXb**	Subwindow
	X1XXXXXXb	Error Diffusion
	XX1XXXXXb	Reserved
	XXX1XXXXb	Reserved
	XXXX1XXXb	Reserved
	XXXXX1XXb	Reserved
	XXXXXX1Xb	Reserved
	XXXXXXX1b	Reserved

Compression Function: 11100000 00000000b

Compression Function field of each bit indicates Compression Functions supported by the scanner.

Table 3.25 Compression Function

Byte	Bit	Description
90	`1XXXXXXXb`	MH
	`X1XXXXXXb`	MR
	`XX1XXXXXb`	MMR
	`XXX1XXXXb`	JBIG
	`XXXX1XXXb`	JPEG Base Line System
	`XXXXX1XXb`	JPEG Extended System
	`XXXXXX1Xb`	JPEG Independent Function
	`XXXXXXX1b`	Reserved
91	`00000000b`	Reserved

Endorser Function: 00000000 00000000b(without ENDORSER)
                     10000001 00000000b(with ENDORSER)

Endorser Function field of upper 4bit indicates available endorser functions and lower 4bit indicates maximum Endorser Identifiers.

Table 3.26 Endorser Function

Byte	Bit	Description
92	`1XXXXXXXb`	Mechanical Endorser
	`X1XXXXXXb`	Stamper
	`XX1XXXXXb`	Electrical Endorser
	`XXX1XXXXb`	Reserved
	`XXXXnnnnb`	Maximum Endorser Identifiers
93	`00000000b`	Reserved

Barcode Function: 00000000 00000000 00000000 00000000b

Barcode Function field is reserved.

REQUEST SENSE Command (See ANSI SCSI-2 8.2.14)

The REQUEST SENSE command (Table 3.27) requests that the target transfer sense data to the initiator.

Table 3.27 REQUEST SENSE Command

Bit Byte	7	6	5	4	3	2	1	0
0	Operation Code (03h)							
1	Logical Unit Number			Reserved				
2	Reserved							
3	Reserved							
4	Allocation Length							
5	Control							

The sense data:

1) shall be available if a contingent allegiance condition exists for the I_T_x nexus;

2) shall be available if other information is available in any field;

3) may be available if an unexpected disconnect occurred.

If the target has no other sense data available to return, it shall return a sense key of NO SENSE and an additional sense code of NO ADDITIONAL SENSE INFORMATION.

The sense data shall be preserved by the target for the initiator until retrieved by a REQUEST SENSE command or until the receipt of any other I/O process for the same I_T_x nexus. Sense data shall be cleared upon receipt of any subsequent I/O process (including REQUEST SENSE) to the same I_T_x nexus.

The sense data format for error code 70h(current errors) is supported.

Table 3.28 Sense Data Format

Bit Byte	7	6	5	4	3	2	1	0
0	Valid	Error Code (70h)						
1	Segment Number							
2	Filemark	EOM	ILI	Reserved	Sense key			
3	(MSB)	Information						
6								(LSB)
7	Additional Sense Length							
8	(MSB)	Command Specific Information						
11								(LSB)
12	Additional Sense Code							
13	Additional Sense Code Qualifier							
14	Field Replaceable Unit Code							
15	SKSV	Sense Key Specific						
17								

Valid: 1b(Valid Information)

Segment Number: 00h(not supported)

Filemark: 0b(Reserved)

EOM (End of Medium):   This bit of 1 indicates end of reading a window.

ILI (Incorrect Length Indicator):

This scanner use this bit when total read image data is not equal to defined window data.

The sense key, additional sense code and additional sense code qualifier provide a hierachy of information. The intention of the hierarchy is to provide a top down approach for an initiator to determine information relating to the error and exception conditions. The sense key provides generic categories in which error and exception condition can be reported. Initiators would typically use sense keys for high level error recovery procedures. Additional sense codes provide further detail describing the sense key. Additional sense code qualifiers add further detail to the additional sense code. The additional sense code and additional sense code qualifier can be used by initiators where sophisticated error recovery procedures require detailed information describing the error and exception conditions.

The sense key field is mandatory and indicates generic information describing an error or exception condition. The sense key used are defined in Table 3.29.

Table 3.29 Sense Key Descriptions

Sense Key	Description
0h	NO SENSE. Indicates that there is no specific sense key information to be reported for the designated logical unit. This would be the case for a successful command or a command that received CHECK CONDITION or COMMAND TERMINATED status because one of the filemark, EOM, or ILI bits is set to one.
2h	NOT READY. Indicates that the logical unit addressed cannot be accessed. Operator intervention may be required to correct this condition.
3h	MEDIUM ERROR. Indicates that the command terminated with a non-recovered error condition that was probably caused by a flaw in the medium or an error in the recorded data. This sense key may also be returned if the target is unable to distinguish between a flaw in the medium and a specific hardware failure (sense key 4h)
4h	HARDWARE ERROR. Indicates that the target detected a non-recoverable hardware failure (for example, controller failure, device failure parity error, etc.) while performing the command or during a self test.
5h	ILLEGAL REQUEST. Indicates that there was an illegal parameter in the command descriptor block or in the additional parameters supplied as data for some commands (FORMAT UNIT, SEARCH DATA, etc.). If the target detects an invalid parameter in the command descriptor block then it shall terminate the command without altering the medium. If the target detects an invalid parameter in the additional parameters supplied as data, then the target may have already altered the medium. This sense key may also indicate that an invalid INDENTIFY message was received
6h	UNIT ATTENTION. Indicates that the removable medium may have been changed or the target has been reset. See ANSI SCSI-2 7.9 for more detailed information about the unit attention condition.
Bh	ABORTED COMMAND. Indicates that the target aborted the command. The initiator may be able to recover by trying the command again.

Information: 00000000h(If ILI=0)

The information field is valid when ILI bit is set to 1 for READ command, the difference of the required length(Transfer Length) minus the actual length in bytes. (Negative values are indicated by two's complement notation)

Additional Sense Length: 0Ah(10 bytes)

This field indicates the number of additional sense bytes to follow. If the allocation length of the command descriptor block is too small to transfer all of the additional sense bytes, the additional sense length is not adjusted to reflect the truncation.

Command Specific Information: 00000000h(not supported)

ASC (Additional Sense Code):   This field indicates further information related to the error or exception condition reported in the sense key field.

The additional sense code qualifier (ASCQ) indicates detailed information related to the additional sense code.

Field replaceable unit code: 00h(not supported)

Sense Key specific bytes: 000000h(not supported)

The additional sense bytes field may contain command specific data, peripheral device specific data, or vendor specific data that further defines the nature of the CHECK CONDITION status.

Table 3.30 Implementation of SK(Sense Key), ASC(Additional Sense Code), ASCQ(Additional Sense Code Qualifier) Hierachy.

Sense key	Additional Sense Code	Additional Sense Code Qualifier	Description
0	00h	00h	No Sense
2	00h	00h	Not Ready
	80h	01h	Interlock Switch Is Opened
3	80h	01h	Jam*1
		02h	ADF Cover Open
		03h	Chuter Out Of Paper
		04h	Job Separation Sheet detected
	80h	08h	Roller unit not set
	80h	10h	Print Head on Endorser check
	43h	00h	MESSAGE ERROR
4	44h	00h	Internal Target Failure
	80h	01h	FB Motor Fuse Blown
		02h	Heater Fuse Blown
		03h	Lamp Fuse Blown
		04h	ADF Motor Fuse Blown
		05h	Mechanical System Failure
		06h	Optical System Failure
	80h	10h	Endorser Failure
	80h	11h	Endorser Fuse Blown
5	20h	00h	INVALID COMMAND OPERATION CODE
	24h	00h	INVALID FIELD IN CDB
	25h	00h	LOGICAL UNIT NOT SUPPORTED
	26h	00h	INVALID FIELD IN PARAMETER LIST
	2Ch	02h	INVALID COMBINATION OF WINDOWS SPECIFIED

*1 If this unit detects a double-feed status while the double-feed detection function is validated for GH/G, a paper jam is reported to the host.

Table 3.30 Implementation of SK(Sense Key), ASC(Additional Sense Code), ASCQ(Additional Sense Code Qualifier) Hierachy. (continued)

Sense key	Additional Sense Code	Additional Sense Code Qualifier	Description
6	00h	00h	Unit Attention
B	47h	00h	SCSI Parity Error
	80h	01h	Image Transfer Error

SEND DIAGNOSTIC Command

The SEND DIAGNOSTIC Command (Table 3.31) requests the target to perform diagnostic operations on itself, on the logical unit, or on both. This scanner supports only the self test feature with the parameter list length of zero.

Table 3.31 SEND DIAGNOSTIC Command

Bit / Byte	7	6	5	4	3	2	1	0
0	Operation Code (1Dh)							
1	Logical Unit Number			PF	Reserved	SelfTest	DevOfL	UnitOfL
2	Reserved							
3	(MSB)			Parameter List Length				
4								(LSB)
5	Control							

PF(Page Format):   0b(ignored)

SelfTest(Self Test):   1b(SelfTest)

This bit is of one directs the target to complete its default selftest. If the selftest successfully passes, the command shall be terminated with GOOD status; otherwise, the command shall be terminated with CHECK CONDITION status and the sense key shall be set to HARDWARE ERROR.

DevOfL (Device Off Line): 0b(ignored)

UnitOfL (Unit Off Line):   0b(ignored)

Parameter List Length: 0000h(not supported)

SET WINDOW Command

The SET WINDOW command provides a means for the initiator to specify one or more windows within the scanning range of the device. This duplex scanner supports one window for each front and back page.

Table 3.32 SET WINDOW Command

Bit Byte	7	6	5	4	3	2	1	0
0	Operation Code (24h)							
1	Logical Unit Number			Reserved				
2	Reserved							
3	Reserved							
4	Reserved							
5	Reserved							
6	(MSB)							
7	Transfer Length							
8								(LSB)
9	Control							

The transfer length specifies the length in bytes of the data that shall be sent during the DATA OUT phase. A transfer length of zero indicates that no window parameters data shall be transferred. This condition shall not be considered as an error.

The window parameters data shall consist of a header followed by one or more window descriptors. Each window descriptor specifies the location, size and scanning method used for a window.

The set window data header is defined in Table 3.33.

Table 3.33 Set Window Data Header

Bit Byte	7	6	5	4	3	2	1	0
0	Reserved							
1	Reserved							
2	Reserved							
3	Reserved							
4	Reserved							
5	Reserved							
6	(MSB)		Window Descriptor Length					
7								(LSB)

The window descriptor length specifies the length in bytes of a single window descriptor. Each descriptor shall be of equal length. The first forty-eight bytes are defined in this standard and the remaining bytes in each descriptor are vendor specific.

Table 3.34 Window descriptor Bytes

Bit Byte	7	6	5	4	3	2	1	0
0	Window Identifier							
1	Reserved							Auto
2	(MSB)		X-Axis Resolution					
3								(LSB)
4	(MSB)		Y-Axis Resolution					
5								(LSB)
6	(MSB)		X-Axis Upper Left					
9								(LSB)
10	(MSB)		Y-Axis Upper Left					
13								(LSB)
14	(MSB)		Window Width					
17								(LSB)
18	(MSB)		Window Length					
21								(LSB)
22	Brightness							
23	Threshold							
24	Contrast							
25	Image Composition							
26	Bit Per Pixel							
27	(MSB)		Halftone Pattern					
28								(LSB)
29	RIF	Reserved				Padding Type		
30	(MSB)		Bit Ordering					
31								(LSB)
32	Compression Type							
33	Compression Argument							
34	Reserved							
39								
40	Vendor Specific Parameter Byte(s)							
n								

Window Identifier: 00h(front side) or 80h(back side)

The window identifier specifies the window defined by the window descriptor. A window is referenced by the window identifier during data transfers and parameter updates.

Fujitsu defines for duplex scanner, window identifiers 00h to 7Fh are used for front page and 80h to FFh are used for back page, implicitly. This scanner supports one window for each side, therefore, window identifier 00h for front page and window identifier 80h for back page.

Auto: 0b (Reserved)

X-Axis Resolution: 0(400dpi), 200, 240, 300, 400 dpi (without IPC2)
                     0(400dpi), 50 to 400dpi at 1dpi step (with IPC2)

The x-axis resolution field specifies the resolution in the scan line directionThe unit of measure is picture elements(pixels) per inch. A value of zero specifies the default resolution.

Y-Axis Resolution: 0(400dpi), 200, 240, 300, 400 dpi (without IPC2)
                     0(400dpi), 50 to 400dpi at 1dpi step (with IPC2)

The y-axis resolution field specifies the resolution in the base line direction The unit of measure is picture elements(pixels) per inch. A value of zero specifies the default resolution.

X-Axis Upper Left: 0 to 14592 [1/1200 inch] for M3099GX
                     0 to 10368 [1/1200 inch] for M3099GH

The x-axis upper left field specifies the x-axis coordinate of the upper left corner of the window. This coordinate is measured from the scan line using the target's current measurement unit divisor.

Y-Axis Upper Left: 0 to 20736 [1/1200 inch]

The y-axis upper left field specifies the y-axis coordinate of the upper left corner of the window. This coordinate is measured from the base line using the target's current measurement unit divisor.

Window Width: 0 to 14592 [1/1200 inch] for M3099GX
                     0 to 10368 [1/1200 inch] for M3099GH

The window width field specifies the width of window in scan line direction. The window width is measured using the target's current measurement unit divisor.

Window Length: 0 to 20736 [1/1200 inch]

The window length field specifies the length of the window in the base line direction. The window length is measured using the target's current measurement unit divisor.

Note: The relation between X-Axis Resolution, Y-Axis Resolution, X-Axis Upper Left, Y-Axis Upper Left, Window Width, Window Length.

Upper Left X field value: ULX

Upper Left Y field value: ULY

Width field value: W

Length field value: L

X Resolution: XR

Y Resolution: YR

1) Maximum Scanning Area limitations
   $0 < (ULX+W) \leq 14592$ [1/1200 inch] for M3099GX
                    10368 [1/1200 inch] for M3099GH
   $0 < (ULY+L) \leq 20736$ [1/1200 inch]

2) Width and X Resolution limitation
   $9 \leq (XR \times W/1200) \leq 4864$ [dot] for M3099GX
                         3456 [dot] for M3099GH

3) Length and Y Resolution limitation
   $1 \pounds (YR \times L/1200) \leq 6912$ [line]

4) Horizontal and Vertical limitation (M3099GX only)
   if (13200(11") < (ULX+W) ≤ 14592)
   then $0 < (ULY+L) \leq 19842$(A3 length) ;

Brightness: 0 to 255

The brightness field specifies the level of brightness used to scan the object. A value of zero specifies the default brightness. Any other value indicates a relative brightness setting with 255 being the highest setting, one being the lowest setting, and 128 being the nominal setting.The brightness effects for Halftone image.

Table 3.35 Brightness

Value	Brightness
00h	Default (same to 80h)
01h 80h FFh	Brightest Normal Darkest

Threshold: 0 to 255

The threshold field specifies the threshold at which scan data is converted tobinary data. A value of zero specifies the default threshold at automatic threshold control if it is supported. Any other value indicates a relative threshold setting with 255 being the highest setting, one being the lowest setting, and 128 being the nominal setting. The threshold effects for Line Art image.

Table 3.36 Threshold

Value	Threshold
00h	Default (same to 80h) Dynamic Threshold or Simplified Dynamic Threshold
01h 80h FFh	Brightest Normal Darkest

Contrast: 0 to 255

The contrast field specifies the level of contrast used to scan the object. Avalue of zero specifies default contrast or automatic contrast if it is supported. Any other value indicates a relative contrast setting with 255 being the highest setting, one being the lowest setting, and 128 being the nominal setting.

Table 3.37 Contrast

Value	Contrast
00h	Default (same to 80h)
01h | 80h | FFh	Soften Normal Harden

Image Composition: 00h(Black and white), 01h(halftoned)

The image composition field specifies the type of scan operation requested. The image composition is defined as shown in Table 3.38.

Table 3.38 Image Composition Codes

Code	Description
00h	Bi-level black and white
01h	Dithered/halftone black & white
02h to FFh	Reserved

Bits Per Pixel: 01h(1bit per pixel)

The bits per pixel field specifies the number of bits used to represent the intensity of a single color.

Halftone: Table 3.39, 3.40

The halftone field specifies the level of halftone at which the scan data is converted to binary data. The values in this field are vendor specific. This halftone field is used in conjunction with the image composition field. Fujitsu defines this field two subfields to fitst byte as Halftone Type field and second byte as Halftone Pattern.

Halftone type: 00h(default), 01h(dither), 02h(error diffusion)

Halftone Type field specifies method of halftoning shown in Table 3.39. A value of zero indicates default halftoning method of the device.

Table 3.39 Halftone Type

Value	Halftoning method
00h	Default. (same to 01h: dither)
01h	Dither
02h	Error Diffusion
03h to FFh	Reserved

Halftone pattern: 00h to 03h(resident), 80h to 87h(downloaded)

Halftone Pattern field specifies arguments of halftone type. This field is defined for Halftone Type - Dither as shown in Table 3.40. For other halftone type this field is reserved.

Table 3.40 Halftone Pattern

Value	Halftone pattern
00h	Dither pattern 0
01h	Dither pattern 1
02h	Dither pattern 2
03h	Dither pattern 3
04h to 7Fh	Reserved
80h to 87Fh	Downloaded Pattern
85h to FFh	Reserved

Reverse Image Format (RIF):   0b, 1b(with IPC2)

A reverse image format (RIF) bit of zero inidicates that white pixels are to be indicated by zeros and black pixels are to be indicated by ones. A RIF bit of one indicates that white pixels are to be indicated by ones and black pixels are to be indicated by zeros. The RIF bit is applicable only for images represented by one bit per pixel.

Padding Type: 00h(no padding)

The padding type field specifies how the target shall pad the image data transmitted to the initiator if it is not an integral number of bytes.

Bit Ordering: 0000h(not supported)

The bit ordering field is not supported.

Compression Type, Compression Argument: Table 3.41

The compression type and compression argument fields specify the compression technique to be applied to the image data (see Table 3.41).

Table 3.41 Compression Types and Arguments

Compression Code	Description	Compression Argument
00h	No Compression	Reserved
01h	CCITT Group III, 1 dimensional	Reserved
02h	CCITT Group III, 2 dimensional	K factor
03h	CCITT Group IV, 2 dimensional	Reserved
04h to FFh	Reserved	Reserved

Note: K factor can be specified from 0 to 255. 0 indicates K factor = ∞

Vendor Unique Parameters

After byte 40 of Set Window Data is defined as Vendor Specific Parameter. Fujitsu Image Scanners define this area for additional informations of window. The type of paramters are distinguished by Vendor Unique Identification Code value. This scanner supports additional 24 bytes length Image Processing Parameter(Vendor Unique Identification Code 00h).

Image Processing Parameter: Table 3.42

Table 3.42 Image Processing Parameter

Bit Byte	7	6	5	4	3	2	1	0
40	Vendor Unique Identification Code							
41	Gamma Correction							
42	Outline Extract							
43	Image Emphasis							
44	Automatic Separation							
45	Mirroring							
46	SDTC parameter							
47	DTC mode							
48								
49	Reserved							
50	White Level Follower mode							
51	Barcode Window List							
52	Subwindow List							
53	Paper Size							
54	(MSB)	Paper Width X						
57								(LSB)
58	(MSB)	Paper Length Y						
61								(LSB)
62	DTC selection							
63	Reserved							

Vendor Unique Identification Code:

00h(Image Processing Parameter)

The vendor unique identification code field specifies type if vendor unique parameter.

Gamma Correction: 00h to 03h(resident), 80h to 87h(downloaded)

This gamma correction field specifies Gamma Correction Table.

Table 3.43 Gamma Correction Table

Value	Gamma Correction Table
00h	Default (Normal)
01h	Normal
02h	Soft
03h	Sharp
04h to 7Fh	Reserved
80h to 87h	Downloaded Gamma Table
88h to FFh	Reserved

Outline Extract: 00h, 80h(with IPC2)

The outline extract field specifies contour extraction of image.

Table 3.44 Outline Extract

Value	Description
00h	Default (Disable Outline)
01h to 7Fh	Reserved
80h	Enable Outline
81h to FFh	Reserved

Image Emphasis: 00h, 80h(with IPC2)

The image emphasis field specifies filtering function. 01h to 7Fh specifies Emphasis. 80h to FFh specifies Smoothing.

Table 3.45 Image Emphasis

Value	Description
00h	Disable
01h to 2Fh	Low Emphasis
30h to 4Fh	Medium Emphasis
50h to 7Fh	High Emphasis
80h to FFh	Smoothing

Automatic Separation: 00h, 80h(with IPC2)

The automatic separation field specifies automatic separation function.

Table 3.46 Automatic Separation

Value	Description
00h	Default (Disable Automatic Separation)
01h to 7Fh	Reserved
80h	Enable Automatic Separation
81h to FFh	Reserved

Mirroring: 00h, 80h(with IPC2)

This field specifies flip left and right of image.

Table 3.47 Mirroring

Value	Description
00h	Default (Disable Mirror)
01h to 7Fh	Reserved
80h	Enable Mirror
81h to FFh	Reserved

SDTC parameter: 00h(reserved)
                  00h, 01h to FFh(with IPC2)

The SDTC parameter field specifies SDTC (Simplified Dynamic Threshold Circuit) parameter. This parameter specifies variance rate of threshold.

Table 3.48 SDTC parameter

Value	Description
00h	Default
01h to 1Fh	Small
20h to 3Fh	↑
40h to 5Fh	
60h to 7Fh	
80h to 9Fh	Normal
A0h to BFh	
C0h to DFh	↓
E0h to FFh	Big

DTC Mode: 0000h(without IPC2), XXXXh(with IPC2)

The DTC Mode field specifies Dynamic Threshold Circuit mode parameters.

Table 3.49 DTC Mode - Byte 47

value(bit)	Description		
1xxxxxxxb	Ball Point Pen Mode	- Enable	
0xxxxxxxb		- Disable	
x00xxxxxb	Smoothing Mode	- OCR	
x01xxxxxb		- Scanner	
x10xxxxxb		- Undefined	
x11xxxxxb		- Undefined	
xxx00xxxb	Gradation	- Ordinal Image	
xxx01xxxb		- High Contrast	
xxx1xxxxb		- Reserved	
xxxxx000b	Threshold Curve	- Light : for OCR	
xxxxx001b		- |	
xxxxx010b		- |	
xxxxx011b		- |	
xxxxx100b		- |	
xxxxx101b		- Dark	
xxxxx110b		- Dark : for Scanner	
xxxxx111b		- Light	

Table 3.50 DTC Mode - Byte 48

value(bit)	Description		
000xxxxxb	Noise Removing		- Enable
001xxxxxb			- Disable
00x0xxxxb	matrix size	5x5	- Disable
00x1xxxxb			- Enable
00xx1xxxb		4x4	- Disable
00xx0xxxb			- Enable
00xxx1xxb		3x3	- Disable
00xxx0xxb			- Enable
00xxxx1xb		2x2	- Disable
00xxxx0xb			- Enable
00xxxxx1b	Equal to Threshold		- Black
00xxxxx0b			- White

White Level Follower: 00h, 80h, C0h

The white level follower field specifies white level follower operation.

Table 3.51 White Level Follower

value	Description
00h	Default (Depends on IMAGE COMPOSITION)
	<table><tr><td>IMAGE COMPOSITION</td><td>00h</td><td>Enable</td></tr><tr><td></td><td>01h</td><td>Disable</td></tr></table>
01h to 7Fh	Reserved
80h	Enable
81h to BFh	Reserved
C0h	Disable
C1h to FFh	Reserved

Barcode Window List: 00000000b(Reserved)

Subwindow List: 00000000b(Reserved)

Paper Size:
The paper size field specifies paper size which would be fed through ADF.
If 00h is specified in this field, these functions are disabled.

Table 3.52 Paper Size

Value	Description	
00xxxxxxb	Undefined	
01xxxxxxb	Undefined	
10xxxxxxb	Standard Paper(bits 4 to 0 enable)	
11xxxxxxb	Non Standard Paper(Paper Width X, Paper Length Y effective)	
xx0xxxxxb	Image Transfer Top to Bottom	
xx1xxxxxb	Reserved	
xxx0xxxxb	Orientation	- Portrait
xxx1xxxxb		- Landscape
xxxx0000b	Standard Paper Size	- Undefined
xxxx0001b		- Undefined
xxxx0010b		- Undefined
xxxx0011b		- A3 (M3099GX) Undefined (M3099GH)
xxxx0100b		- A4
xxxx0101b		- A5
xxxx0110b		- 11'x17' (M3099GX) Undefined (M3099GH)
xxxx0111b		- 8.5'x11'
xxxx1000b		- Undefined
xxxx1001b		- Undefined
xxxx1010b		- Undefined
xxxx1011b		- Undefined
xxxx1100b		- B4 (M3099GX) Undefined (M3099GH)
xxxx1101b		- B5
xxxx1110b		- Undefined
xxxx1111b		- 8.5'x14'

Paper Width X:

> The paper width x field specifies paper width in 1/1200 inch when paper size was specified as non standard paper.

Paper Length Y

> This field specifies paper length in 1/1200 inch when Paper Size was specified as Non Standard Paper.

Notes: 1. If the ADF is used and this parameter is not specified, the paper is scanned as default paper size(A3 for M3099GX or A4 for M3099GH).

2. This Paper Size is assuming the document which will be fed through ADF. The window area specified in window descriptor block (Upper Left X, Upper Left Y, Width, Length) must be equal or less than specified paper size.

3. The Fujitsu Image Scanners calculate window origin from ADF center, therefore, if Paper Size is not specified window will be located in unexpected position.

DTC Selection: 00h, 40h(with IPC2), 80h(with IPC2)

The DTC selection field specifies which DTC is activated.

Table 3.53 DTC Selection

Value	Description
00000000b	Default: Simplified DTC (with IPC2)
01000000b	Dynamic Threshold Circuit (with IPC2)
10000000b	Simplified DTC (with IPC2)
11000000b	Reserved
others	Reserved

Notes: 1. If simplified DTC is selected SDTC parameter will be referenced.

2. If DTC is selected DTC mode will be referenced.

OBJECT POSITION

The OBJECT POSITION command (Table 3.54) provides positioning functions. Absolute as well as relative positioning is provided. A target shall return CHECK CONDITION status and set the sense key to ILLEGAL REQUEST if a positioning function is requested that is not supported.

Table 3.54 OBJECT POSITION Command

Bit Byte	7	6	5	4	3	2	1	0
0	Operation Code (31h)							
1	Logical Unit Number			Reserved		Position Function		
2	(MSB)							
3	Count							
4								(LSB)
5	Reserved							
6	Reserved							
7	Reserved							
8	Reserved							
9	Control							

This position function field specifies the requested function (see Table 3.55).

Table 3.55 Position Function

Position Function	Description
000b	Unload Object
001b	Load Object
others	Reserved

Unload Object : This position function specifies that the object shall be positioned for removal. If upon receipt of this command there is no object loaded, the target shall return a GOOD status. This condition shall not be considered as an error. If the target is unable to unload the object (i.e. paper jam or mis-feeding condition), the target shall return CHECK CONDITION status and set the sense key sense to MEDIUM ERROR.

Load Object : The position function specifies that the object is to be loaded and positioned to the base line. If upon receipt of this command there is a object already loaded, the target shall returns GOOD status. This condition shall not be considered as an error. If an object is not loaded and the target is unable to load an object, the target shall return CHECK CONDITION status and set the EOM bit to one and the sense key to MEDIUM ERROR.

Count :   000000h(Reserved)

SEND Command

The SEND command (Table 3.56) transfers data from the initiator to the target.

Table 3.56 SEND Command

Bit Byte	7	6	5	4	3	2	1	0
0	Operation Code (2Ah)							
1	Logical Unit Number			Reserved				
2	Data Type Code							
3	Reserved							
4	(MSB)	Data Type Qualifier						
5								(LSB)
6	(MSB)							
7	Transfer Length							
8								(LSB)
9	Control							

Data Type Code: 02h(Halftone Mask), 03h(Gamma Function)
                      90h(Endorser Data)

Data Type Qualifier: 0 to 7(Halftone Mask), 0 to 7(Gamma Function)

Data Type Codes are defined in READ command.

For the Data Type Code 02h(Halftone Mask), this field indicates Halftone Mask identifier. Available identifier number is depends on numbers of downloadable halftone masks. If higher identifier is specified, CHECK CONDITION status is returned and Sense Key is set to ILLEGAL REQUEST.

This scanner supports 8 Halftone Masks. Halftone Mask identifier 0 to 7 are available.

For the Data Type Code 03h(Gamma Function), this field indicates Gamma Function Table identifier. Available identifier number is depends on numbers of downloadable Gamma Function Table. If higher identifier is specified, CHECK CONDITION status is returned and Sense Key is set to ILLEGAL REQUEST.

For the other Data Type Code, this field is reserved.

The transfer length specifies the number of blocks the target shall transfer from the initiator during the DATA OUT phase. This scanner block size is defined as one byte by following JBMS. A transfer length of zero, is not considered an error and no data shall be transferred.

If longer acceptable data length is specified in transfer length, CHECK CONDITION status is returned and ILLEGAL REQUEST is set to Sense Key.

Maximum Transfer Length of this scanner is 1034 bytes.

This command shall be terminated with a status of RESERVATION CONFLICT if any reservation access conflict (see ANSI SCSI-2 10.2.10) exists and no data shall be transferred.

SEND Data

Halftone Mask

Table 3.57 Halftone Mask

Bit Byte	7	6	5	4	3	2	1	0
0				Reserved				
3								
4	(MSB)		X direction Halftone Mask Size					
5								(LSB)
6	(MSB)		Y direction Halftone Mask Size					
7								(LSB)
8				Reserved				
9				Reserved				
10				Halftone Mask Data				
n								

X direction Halftone Mask Size: 8

This field specifies halftone mask size in x direction.

Y direction Halftone Mask Size: 8

This field specifies halftone mask size in y direction.

X and Y direction halftone mask must be equal size.

Halftone Mask Data:

The Halftone Mask Data specifies halftone mask to be transferred to target. The byte data order is left to right, upper to lower nature. Halftone Mask is a series of threshold values applied to grayscale image data. 0 is the lowest and 255 is the highest.

Example   **8x8 halftone mask**

X

D00	D00	D02	D03	D04	D05	D06	D07
D10	D11	D12	D13	D14	D15	D16	D17
D20	D21	D22	D23	D24	D25	D26	D27
D30	D31	D32	D33	D34	D35	D36	D37
D40	D41	D42	D43	D44	D45	D46	D47
D50	D51	D52	D53	D54	D55	D56	D57
D60	D61	D62	D63	D64	D65	D66	D67
D70	D71	D72	D73	D74	D75	D76	D77

Y labels the rows.

Transfer Order and Data

ORDER	0	1	2	3	4	5	6	7	8	9	10
DATA	00h	00h	00h	00h	00h	00h	00h	00h	00h	00h	00h

11	12	13	14	15	16	17	18
D00	D00	D02	D03	D04	D05	D06	D07

19	20	21	22	23	24	25	26
D10	D11	D12	D13	D14	D15	D16	D17

⋮

59	60	61	62	63	64	65	66
D60	D61	D62	D63	D64	D65	D66	D67

67	68	69	70	71	72	73	74
D70	D71	D72	D73	D74	D75	D76	D77

Gamma Function

Table 3.58 Gamma Function Data Format

Bit Byte	7	6	5	4	3	2	1	0
0	Gamma Correction Table Identifier							
1	Reserved							
2	Gamma Correction Table Order							
3	Bit Padding Type							
4	Source Table Size							
5								
6	Destination Table Size							
7								
8	Reserved							
9	Reserved							
10	Gamma Correction Table Data							
n								

Gamma Correction Table Identifier: 00h(Black and White)

The gamma correction table identifier field specifies identifier to distinguish the types of Gamma Correction Table.

Gamma Correction Table Order: 00h(Reserved)

The gamma correction table order field specifies order of color table to be transferred to target in Gamma Correction Table Data.

Bit Padding Type:　　　　　00h(Reserved)

The bit padding type field is reserved for extension of higher than 8bit data.

Source Table Size:　　　　　0100h(255 step)

The source table size field specifies the range of input value to Gamma Correction Table.

Destination Table Size: 0100h(255 step)

The destination table size field specifies the range of output value to Gamma Correction Table.

Gamma Correction Table Data:

The gamma correction table data transfers look up table for image data to be scanned.

Example - 256 steps of grayscale

INPUT	0	1	2	3	4	5	6	7	8	9
OUTPUT	00h	00h	00h	00h	00h	00h	00h	00h	00h	00h

ORDER	10	11	12	13	14	15	16	17	…	263	264	265
DATA	D0	D0	D0	D0	D0	D0	D0	D0	…	D253	D254	D255

D0 to D255 can be any 0 to 255 value. Each data is one byte length.

Endorser Data

See ENDORSER Command.

SCAN Command

The SCAN command (Table 3.59) requests the target begin a scan operation.

Table 3.59 SCAN Command

Bit Byte	7	6	5	4	3	2	1	0
0	Operation Code (1Bh)							
1	Logical Unit Number			Reserved				
2	Reserved							
3	Reserved							
4	Transfer Length							
5	Control							

The transfer length specifies the length in bytes of the window identifier list that shall be sent during the DATA OUT phase. A transfer length of zero indicates that no data shall be transferred. This condition shall not be considered as an error.

The window identifier list consists of zero or more window identifiers each of which specifies a window to be scanned.

This command is mandatory when scanning in duplex mode by sending window identifier 00h, 80h. When scanning in simplex mode this command is not required but it can be available. In the simplex mode, only 00h(front page) is specifiable.

READ Command

The READ command (Table 3.60) requests that the target transfer data to this initiator.

Table 3.60 READ Command

Bit Byte	7	6	5	4	3	2	1	0
0	Operation Code (28h)							
1	Logical Unit Number			Reserved				
2	Data Type Code							
3	Reserved							
4	(MSB)	Data Type Qualifier						
5								(LSB)
6	(MSB)							
7				Transfer Length				
8								(LSB)
9	Control							

Data Type Codes: 00h(Image), 80h(Pixel Size),
                           81h(Detected Paper Information)

The transfer data type distinguishes between the different types of data which may be transferred between the initiator and the target. The types of transfers are specified in Table 3.61. Data Type Code and Data Type Qualifier are commonly used with SEND command.

Table 3.61 Data Type Codes

Code	Description	Command
00h	Image	READ
01h	Vendor Specific	
02h	Halftone Mask	SEND
03h	Gamma Function	SEND
04h - 7Fh	Reserved	
80h - FFh	Vendor specific	
80h	Pixel Size	READ
81h	Detected Paper Information	READ
others	Reserved	

Data Type Qualifier:

The data type qualifier field provides a means to differentiate data transfers of the same data type code. The values used in this field are vendor specific. This scanner uses this field for Image Data as follows.

    Byte 4: Reserved
    Byte 5: Window Identifier

Strictly speaking, SCAN command is used to specify Window Identifier but we used this field SCAN command can be omitted from scanning sequence.

For the other data type code, data type qualifier field is reserved.

The transfer length specifies the number of blocks the target shall transfer to the initiator during the DATA IN phase. The block size is 1 byte in fujitsu scanner. A transfer length of zero, is not considered an error and no data shall be transferred.
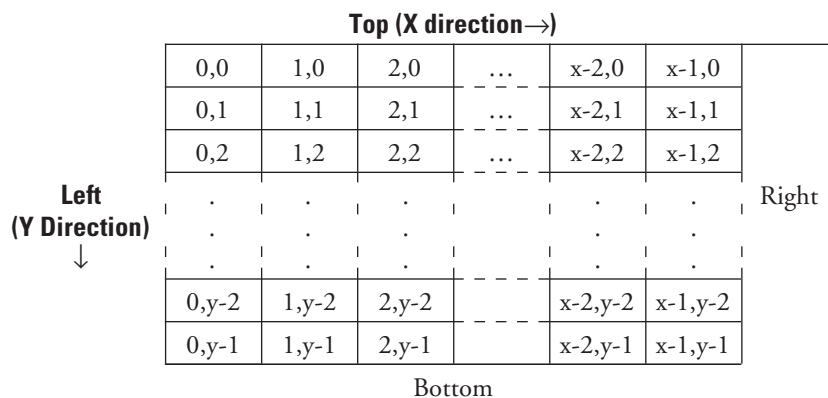
If the target transfers less than transfer length blocks a CHECK CONDITION status shall be returned. The ILI bit is set to one, the valid bit is set to one, and the information bytes are set to the difference (residue) between the requested transfer length and the actual number of blocks transferred.

The command shall be terminated with a status of RESERVATION CONFLICT if any reservation access conflict (see ANSI SCSI-2 10.2.10) exists and no data shall be transferred.

Data Type Format

Image Data (DATA TYPE CODE : 00h)

Pixel Coordinates in a document

Top (X direction→)

0,0	1,0	2,0	…	x-2,0	x-1,0
0,1	1,1	2,1	…	x-2,1	x-1,1
0,2	1,2	2,2	…	x-2,2	x-1,2
.	.	.		.	.
.	.	.		.	.
.	.	.		.	.
0,y-2	1,y-2	2,y-2		x-2,y-2	x-1,y-2
0,y-1	1,y-1	2,y-1		x-2,y-1	x-1,y-1

Left (Y Direction) ↓   Right

Bottom

Bit Order in a Byte of Binary Data

X dir.	0	1	2	3	4	5	6	7	8	9	10	…
Bit Order	(MSB)			Byte 0				(LSB)	(MSB)		Byte 1	
in Byter	7	6	5	4	3	2	1	0	7	6	5	…

Bi-level or Dithered/Halftone Black and White

Raster 0	(0,0)...(7,0)	(8,0)...(15,0)	...	(x-7,0)...(x,0)
	Byte 0	Byte 1		Byte x/8
Raster 1	(0,1)...(7,1)	(8,1)...(15,1)	...	(x-7,1)...(x,1)
	Byte x/8+1	Byte x/8+2		Byte 2x/8
	. . .	. . .		. . .
Raster y-1	(0,y-1)...(7,y-1)	(8,y-1)...(15,y-1)	...	(x-1,y-1)...(x,y-1)
	Byte (y-1) × x/8+1	Byte (y-1) × x/8+2		Byte y × x/8

Pixel Size Data (DATA TYPE CODE : 80h)

This data can be obtained only before reading image data which is set by SET WINDOW command. The number of pixels can be calculated by formula as below.

Number of X pixels = (X Resolution × Width) / 1200 ;

Number of Y pixels = (Y Resolution × Length) / 1200 ;

These values are not required if number of pixels are calculated by initiator.

Table 3.62 Pixel Size Data

Bit Byte	7	6	5	4	3	2	1	0
0	(MSB)		Number of X-Direction Pixels					
3								(LSB)
4	(MSB)		Number of Y-Direction Pixels					
7								(LSB)
8	(MSB)			Reserved				
15								(LSB)

Detected Paper Information (DATA TYPE CODE 81h)

This scanner will try to detect Paper Size and Job Separation Sheet.

Table 3.63 Detected Paper Information

Bit Byte	7	6	5	4	3	2	1	0
0				Reserved				
1								
2				Job Separation Sheet				
3				Paper Size				
4				Reserved				
7								

Job Separation Sheet: 00h, 80h

This field indicates if job separation sheet is detected.

Table 3.64 Job Separation Sheet

Value	Description
00h	Job Separation Sheet is not detected
01h - 7Fh	Reserved
80h	Job Separation Sheet is detected
81h - FFh	Reserved

Paper Size:

This field indicates detected Paper Size by the scanner.

Table 3.65 Paper Size

Value	Description
00xxxxxxb	Paper ejected (Note *3)
01xxxxxxb	Paper loaded (Note *3)
0x0xxxxxb	Paper Size is detected
0x1xxxxxb	Paper Size is not detected
0xx0xxxxb	Portrait (Note *2)
0xx1xxxxb	Landscape (Note *2)
0xxx0000b	Reserved
0xxx0001b	Reserved
0xxx0010b	Reserved
0xxx0011b	A3 or 11'x17' (Note *1) (M3099GX) Reserved (M3099GH)
0xxx0100b	A4 or 8.5'x11'(Note *1)
0xxx0101b	A5
0xxx0110b	Reserved
0xxx0111b	Reserved
0xxx1000b	Reserved
0xxx1001b	Reserved
0xxx1010b	Reserved
0xxx1011b	B4 (M3099GX) Reserved (M3099GH)
0xxx1101b	B5
0xxx1110b	Reserved
0xxx1111b	Reserved

Note :   *1: M3099GX cannot distinguish 11'x17' and A3, 8.5'x11' and A4.
M3099GH can not distinguish 11'x17' and A3/B4.

*2: When this scanner load paper by OBJECT POSITION command(Load Object), detect paper size assuming orientation is Portrait. After ejecting paper by OBJECT POSITION command(Unload Object), orientation and paper size are detected.

*3: This bit is valid only after OBJECT POSITION(Load Object/ Unload Object) is completed.

MODE SELECT(6) Command

The MODE SELECT(6) command (Table 3.66) provides a means for the initiator to specify medium, logical unit, or peripheral device parameters to the target. Targets that implement the MODE SELECT command shall also implement the MODE SENSE command. Initiators should issue MODE SENSE prior to each MODE SELECT to determine supported pages, page lengths, and other parameters.

Table 3.66 MODE SELECT(6) Command

Bit Byte	7	6	5	4	3	2	1	0
0	Operation Code (15h)							
1	Logical Unit Number			PF	Reserved			SP
2	Reserved							
3	Reserved							
4	Parameter List Length							
5	Control							

If an initiator sends a MODE SELECT command that changes any parameters that apply to other initiators, the target shall generate a unit attention condition for all initiators except the one that issued the MODE SELECT command(see ANSI SCSI-2 7.9). The target shall set the additional sense code to MODE PARAMETERS CHANGED.

PF(Page Format):   1b(SCSI-2 format)

SP(Save Pages):   0b(not save pages)

Parameter List Length: 12(Lamp timer), 12(Job separation sheet)

This field specifies the length in bytes of the mode parameter list that shall be transferred from the initiator to the target during the DATA OUT phase. A parameter list length of zero indicates that no data shall be transferred. This condition shall not be considered as an error.

The target shall terminate the command with CHECK CONDITION status if the parameter list length results in the truncation of any mode parameter header, mode parameter block descriptor(omitted in this scanner), or mode page. The sense key shall be set to ILLEGAL REQUEST, and the additional sense code shall be set to PARAMETER LIST LENGTH ERROR.

The mode parameter list for the MODE SELECT and MODE SENSE commands are defined in paragraph Mode Parameter.

MODE SENSE(6) Command

The MODE SENSE(6) command (Table 3.67) provides a means for a target to report parameters to the initiator. It is a complementary command to the MODE SELECT(6) command.

Table 3.67 MODE SENSE(6) Command

Bit Byte	7	6	5	4	3	2	1	0
0	Operation Code (1Ah)							
1	Logical Unit Number			Reserved	DBD	Reserved		
2	PC		Page Code					
3	Reserved							
4	Allocation Length							
5	Control							

DBD (disable block descriptors): 0b

This bit of zero indicates that the target may return zero or more block descriptors in the returned MODE SENSE data (see ANSI SCSI-2 8.3.3), at the target's discretion. A DBD bit of one specifies that the target shall not return any block descriptors in the returned MODE SENSE data. The DBD bit must be 0b in this scanner.

PC (Page Control):   00h(current value)

This field defines the type of mode parameters values to be returned in the mode pages. The page control field is defined in ANSI SCSI-2 Table 55, 8.2.10.1 to 8.2.10.4..

Page Code: 3Dh, 3Eh

The page code specifies which mode page(s) to return. Mode page code usage is defined in Table 3.68.

Table 3.68 Supported Mode Page Code

Page Code	Description
00h	Ignored (Vendor specific)
01h - 3Eh	Reserved
3Dh	Lamp Timer
3Eh	Job Separation Sheet
3Fh	Return all mode pages

An initiator may request the supported mode page from a target. If an initiator issues a MODE SENSE command with a page code value not implemented by the target, the target shall return CHECK CONDITION status and shall set the sense key to ILLEGAL REQUEST and the additional sense code to INVALID FIELD IN CDB.

Mode Parameter

The mode parameter list shown in Table 3.69 contains a header, followed by zero or more block descriptors, followed by zero or more variable-length pages.

Table 3.69 Mode Parameter List

Bit Byte	7	6	5	4	3	2	1	0
0 - n	Mode Parameter Header							
0 - n	Block Descriptor(s)							
0 - n	Page(s)							

Block Descriptor is optional and it is not defined for Scanner Device. This scanner omitts this field.

The six-byte command descriptor block parameter header is defined in Table 3.70.

Table 3.70 Mode Parameter Header(6)

Bit Byte	7	6	5	4	3	2	1	0
0	Mode data length							
1	Medium type (Reserved)							
2	Device specific parameter (Reserved)							
3	Block descriptor length (Reserved)							

When using the MODE SENSE command, the mode data length field specifies the length in bytes of the following data that is available to be transferred. The mode data length does not include itself. When using the MODE SELECT command, this field is reserved.

Medium Type is reserved, Device Specific Parameter,Block Descriptor Length are Reserved for Scanner Device.

The mode page format is defined in Table 3.71.

Table 3.71 Mode Page Format

Bit Byte	7	6	5	4	3	2	1	0
0	PS	Reserved	Page Code					
1	Page Length							
2	Mode Parameter							
n								

Each mode page contains a page code, a page code length, and a set of mode parameters.

PS(parameters savable):   0b(not saved)

When using the MODE SENSE command, a parameters savable (PS) bit of one indicates that the mode page can be saved by the target in non-volatile, vendor-specific location. A PS bit of zero indicates that the supported parameters cannot be saved. When using the MODE SELECT command, the PS bit is reserved. This scanner does not have page save function.

Page Code: 3Dh(Lamp Timer), 3Eh(Job Separation Sheet)

The Page Code fields identifies the format and parameters defined for that mode page.

This scanner supports 3Dh(Lamp Timer), 3Eh(Job Separation Sheet).

The page length field specifies the length in bytes of the mode parameters that follow. If the initiator does not set this value to the value that is returned for the page by the MODE SENSE command, the target shall terminate the command with CHECK CONDITION status. The sense key shall be set to ILLEGAL REQUEST with the additional sense code set to INVALID FIELD IN PARAMETER LIST. The target is permitted to implement a mode page that is less than the full page length defined by this standard provided no field is truncated and the page length field correctly specifies the actual length implemented.

(a) Lamp Timer page

The Lamp Timer page provides to adjust the Turn-Off time of fluorescent lamp.

Table 3.72 Lamp Timer page

Bit Byte	7	6	5	4	3	2	1	0
0	Reserved		Page Code (3Dh)					
1	Page Length (06h)							
2	Lamp Timer							
3	Reserved							
7								

Lamp Timer: 0 to 255 (second)

This field specifies the fluorescent lamp turn off time in second after scanning. 0 specifies default time(60 seconds). 1 through 255 seconds can be specified.

(b) Job Separation Sheet page

Table 3.73 Job Separation Sheet page

Bit Byte	7	6	5	4	3	2	1	0
0	Reserved		Page Code (3Eh)					
1	Page Length (06h)							
2	Job Separation Sheet Parameter							
3	Reserved							
7								

Job Separation Sheet Parameter   : 00h(Disable), 80h(Enable)

Job Separation Sheet Parameter field specifies Job Separation Sheet information in each bit.

Table 3.74 Job Separation Sheet Parameter

Value	Description
0xxxxxxxb	Disable "Job Separation Sheet" detection (default)
1xxxxxxxb	Enable "Job Separation Sheet" detection

If Bit7=1 then when "Job Separation Sheet" is detected CHECK CONDITION will be returned.

ENDORSER Command (ENDORSER option is required)

The ENDORSER command(Table 3.75) specifies to control Mechanical Endorser. If ENDORSER option is not attached, CHECK CONDITION status will be returned and SENSE KEY is set to ILLEGAL REQUEST.

Table 3.75 ENDORSER Command

Bit Byte	7	6	5	4	3	2	1	0
0	Operation Code (C1h)							
1	Logical Unit Number			Reserved				
2	Reserved							
3	Reserved							
4	Reserved							
5	Reserved							
6	Reserved							
7	(MSB)		Transfer Length					
8								(LSB)
9	Control							

The transfer length specifies the length in bytes of the data that shall be sent during the DATA OUT phase. A transfer length of zero indicates that no Endorser Descriptors shall be transferred. This condition shall not considered as an error. The length of an Endorser Descriptor is 4 bytes therefore Transfer Length must be multiple of 4. Otherwise CHECK CONDITION status will be returned and SENSE KEY is set to ILLEGAL REQUEST.

The Endorser Descriptors(Table 3.76) consist of 4 bytes data and are sent during DATA OUT phase in ENDORSER command. If one or more Endorser Data are required, Endorser Descriptor is repeated.

Table 3.76 Endorser Descriptors

Bit Byte	7	6	5	4	3	2	1	0
0	Endorser Data Identifier							
1	STOP	BACK	Reserved					
2	(MSB)		Initial Count					
3								(LSB)

Endorser Data Identifier: 00h

The Endorser Data Identifier specifies a Endorser Data previously sent in SEND command. Endorser Data Identifiers 00h to FEh are specifiable. If FFh is specified, all of the registered Endorser Data are selected. This scanner supports 00h, only.

STOP: 0b(Start)/1b(Stop)

STOP bit of zero specifies that specified Endorser Data Identifier should start printing. STOP bit of one indicates that specified Endorser Data stop printing.

BACK: 1b(back side)

BACK bit of zero indicates that specified Endorser Data is applied to front side of the page. BACK bit of one indicates that specified Endorser Data is applied to back side of the page.

Initial Counts: 0000h to FFFFh (0 to 65535)

Initial Counts specifies initial value of Endorser Data counter. The endorser counter is 16bit length. Signed or unsigned is defined by Endorser String. One Endorser Data could have one endorser counter. Overflow and Underflow will not be detected.

Endorser Data is sent in SEND command to the initiator. If one or more Endorser Data is specified this data structure is repeated.

Table 3.77 Endorser Data

Bit / Byte	7	6	5	4	3	2	1	0
0	Endorser Data Identifier							
1	Reserved	Reserved	DECR	Reserved			CTSTEP	
2	(MSB)	Upper Left X						
5								(LSB)
6	(MSB)	Upper Left Y						
9								(LSB)
10	Font							
11	Size							
12	REVS	Reserved					DIRS	
13	Reserved							
14	Reserved							
15	Reserved							
16	Reserved							
17	Endorser String Length							
18	Endorser Strings							
n								

DECR: 0b(CTSTEP add)

DECR bit of zero specifies CTSTEP value is added to endorser counter. DECR bit of one specifies CTSTEP value is subtracted from endorser counter.

CTSTEP: 00b(no change), 01b, 10b [11b is checked]

CTSTEP field specifies value to be added to or to be subtracted from endorser counter after printing. 1 and 2 are available. If 0 is specified, no increment/decrement executed.

Upper Left X: 00000000h

Upper Left X field specifies X coordinate of upper-left corner of endorser strings rectangle in 1/1200 inch. This field applies signed long integer. This scanner cannot specify Upper Left X coordinate of print position. The 00000000h is regarded as default.

Upper Left Y:

Upper Left Y field specifies Y coordinate of upper-left corner of endorser strings rectangle to be printed in 1/1200 inch. This field applies signed long integer. This scanner does not check validity in this field.

The base point of endorser string is Upper-Left likewise SET WINDOW. Location of Endorser Strings is different from printer strings. This specifies upper-left corner of the rectangle.

Font: 00h(default)

Font field specifies character fonts to be printed. One Endorser Data could have one font.

Table 3.78 Font

Value	Description
00h	Default
01h to 7Fh	Reserved
80h to FFh	Downloaded

Size: 00h(default)

Size field specifies character size to be printed in dots. One Endorser Data could have one size available. This field specifies character height in dots. If zero is specified, default is used.

REVS: 0b

REVS bit specifies Endorser String is reversed. The Endorser String is printed from last character. This scanner does not support this bit.

DIRS: 01b(Table 3.79)

DIRS field specifies direction of Endorser String. This scanner supports 01b only.

Table 3.79 DIRS

Value	Description
00b	Left to Right
01b	Upper to Lower
10b	Right to Left
11b	Lower to Upper

Endorser String Length: net 20("%%" is considered as 1 character)

Endorser String Length field specifies length of Endorser String to be followed in bytes. The Endorser String Length field forms pascal string in conjunction with Endorser String. The Endorser String Length of zero is not considered as error. The maximum printable string length in this scanner is 20 columns including endorser counter value. This scanner supports, only "%05ud" for endorser counter format. This field can be exceeded 20 because of "%%" is two characters but it is recognized "%" as one character.

Endorser Strings field specifies Endorser Strings to be printed. Alpha-numeric(ASCII code 20h to 7Fh) and Endorser counter is available. This field uses C-language printf syntax. Only one numerical argument is available and any escape sequences are not available(ex. "Number of Page %05ud"[20column]). Endorser counter is used as numerical argument implicitly.

Status (See ANSI SCSI-2 7.3)

The status byte and status byte code are defined in Table 3.80, 3.81. A status byte shall be sent from the target to the initiator during the STATUS phase at the completion of each command unless the command is terminated by one of the following events:

a) an ABORT message;

b) an ABORT TAG message; (ABORT TAG is not supported by this scanner)

c) a BUS DEVICE RESET message;

d) a CLEAR QUEUE message;(CLEAR QUEUE is not supported by this scanner)

e) a hard reset condition;

f) an unexpected disconnect.

The STATUS phase normally occurs at the end of a command but in some case may occur prior to transferring the command descriptor block.

Table 3.80 Status Byte

Bit	7	6	5	4	3	2	1	0
	Reserved		Status Byte Code					Reserved

Table 3.81 Status Byte Code

Bits of Status Byte 7 6 5 4 3 2 1 0	Status	
R R 0 0 0 0 0 R	GOOD	Supported
R R 0 0 0 0 1 R	CHECK CONDITION	Supported
R R 0 0 0 1 0 R	CONDITION MET	
R R 0 0 1 0 0 R	BUSY	Supported
R R 0 1 0 0 0 R	INTERMEDIATE	
R R 0 1 0 1 0 R	INTERMEDIATE-CONDITION MET	
R R 0 1 1 0 0 R	RESERVATION CONFLICT	Supported
R R 1 0 0 0 1 R	COMMAND TERMINATED	
R R 1 0 1 0 0 R	QUEUE FULL	
All Other Code	Reserved	
Key: R = Reserved bit		

A definition of the status byte codes is given below.

GOOD: This status indicates that the target has successfully completed the command.

CHECK CONDITION: This status indicates that a contingent allegiance condition has occurred(See ANSI SCSI-2 7.6).

BUSY: This status indicates that the target is busy. This status shall be returned whenever a target is unable to accept a command from an otherwise acceptable initiator (i.e., no reservation conflicts). The recommended initiator recovery action is to issue the command again at a later time.

RESERVATION CONFLICT: This status shall be returned whenever an initiator attempts to access a logical unit or extent within a logical unit that is reserved with conflicting reservation type for another SCSI device (See RESERVE UNIT, RESERVE UNIT commands). The recommended initiator recovery action is to issue the command again at a later time (see ANSI SCSI-2 7.6).

Message(See ANSI SCSI-2 6.5)

The message system allows communication between an initiator and target for the purpose of interface management. A message may be one, two, or multiple bytes in length. One or more messages may be sent during a single MESSAGE phase, but a message may not be split over MESSAGE phase. The initiator is required to end the MESSAGE OUT phase (by negating ATN) when it sends certain messages identified in Table 3.82.

One byte, Two byte, and extended message formats are defined. The first byte of the message determines the format as defined in Table 3.82.

Table 3.82 Message Format

Value	Message Format
00h	One Byte Message (COMMAND COMPLETE)
01h	Extended Messages
02h to 1Fh	One-Byte Messages
20h to 2Fh	Two-Byte Messages (not used)
30h to 7Fh	Reserved
80h to FFh	One-Byte Messages (IDENTIFY)

One-byte messages consist of a single byte transferred during a MESSAGE phase. The value of the byte determines which message is to be performed as defined in Table 3.83 (See ANSI SCSI-2 6.6 Table 10). The implemented Message Codes by this scanner is Table 3.83.

Table 3.83 Message Codes

Code	Support		Message Name	Direction		Nefate ATN Before last ACK
	Init	Targ				
00h	M	M	COMMAND COMPLETE	In		—
02h	O	O	SAVE DATA POINTER	In		—
03h	O	O	RESTORE POINTERS	In		—
04h	O	O	DISCONNECT	In		—
05h	M	M	INITIATOR DETECTED ERROR		Out	Yes
06h	O	M	ABORT		Out	Yes
07h	M	M	MESSAGE REJECT	In	Out	Yes
08h	M	M	NO OPERATION		Out	Yes
09h	M	M	MESSAGE PARITY ERROR		Out	Yes
0Ch	O	M	BUS DEVICE RESET		Out	Yes
80h+	M	O	IDENTIFY	In		—
80h+	M	M	IDENTIFY		Out	No
***	O	O	SYNCHRONOUS DATA TRANSFER REQUEST	In	Out	Yes
others			Reserved			

Key: M: Mandatory support, O = Optional support
In: Target to initiator, out = Initiator to target.
Yes: Initiator shall negate ATN before last ACK of message.
No: Initiator may or may not negate ATN before last ACK of message. (see Attention Condition)
—: Not Applicable
***: Extended message (see Tables 3.84 and 3.85)
80h: Codes 80h through FFh are used for IDENTIFY messages. (See Table 3.86).

A value of one in the first byte of a message indicates the beginning of a multiple byte extended message. The minimum number of bytes sent for an extended message is three. The extended message format and the extended message code are shown in Table 3.84 and 3.85 respectively.

Table 3.84 Extended Message Format

Bit Byte	7	6	5	4	3	2	1	0
0	Extended message (01h)							
1	Extended message length (n)							
2	Extended message code (y)							
3 n+1	Extended message arguments							

The extended message length specifies the length in bytes of the extended message code plus the extended message arguments to follow. Therefore, the total length of the message is equal to the extended message length plus two. A value of zero for extended message length indicates 256 bytes follow.

The extended message codes are listed in Table 3.85 The extended message arguments are specified within the extended message descriptions.

Table 3.85 Extended Message Codes

Code(s)	Description
02h	Reserved (See Note)
00h	MODIFY DATA POINTER
01h	SYNCHRONOUS DATA TRANSFER REQUEST
03h	WIDE DATA TRANSFER REQUEST
04h - 7Fh	Reserved
80h - FFh	Vendor Specific

Note: Extended message code 02h was used for the EXTENDED IDENTIFY message in SCSI-1.

The supported extended message by this scanner is
SYNCHRONOUS DATA TRANSFER only.

The first message sent by the initiator after the SELECTION phase
shall be an IDENTIFY, ABORT, or BUS DEVICE RESET message.
If a target receives any other message it shall go to BUS FREE
phase.(see unexpected disconnect ANSI SCSI-2 6.1.1)

If the first message is an IDENTIFY message, then it may be
immediately followed by other messages, such as the first of a pair of
SYNCHRONOUS DATA TRANSFER REQUEST messages. The
IDENTIFY message establishes a logical connection between the
initiator and the specified logical unit or target routine within the
target known as an I_T_L nexus to be re-established. Only one
logical unit shall be identified for any connection; if a target receives
a second shall go to BUS FREE phase (see unexpected disconnect
ANSI SCSI-2 6.1.1). The treatment of other logical unit addressing
errors is described in ANSI SCSI-2 7.5.

Whenever an I_T_L nexus is established by an initiator that is
allowing disconnection, the Initiator shall ensure that the current
pointers are equal to the saved pointers for that particular logical unit
or target routine. An implied restore pointers operation shall occur as
a result of a reconnection.

ABORT (Init $\rightarrow$ Targ)

The ABORT message is sent from the initiator to the target to clear
any I/O process for the I_T_x nexus. The target shall go to the BUS
FREE phase following successful receipt of this message. The
pending data, status, and I/O processes for any other nexus shall not
be cleared.

Previously established conditions, including MODE SELECT
parameters, reservations, and extended contingent allegiance shall
not be changed by the ABORT message.

BUS DEVICE RESET (Init → Targ)

The BUS DEVICE RESET message is sent from an initiator to direct a target to clear all I/O processes on that SCSI device. This message forces a hard reset condition to the selected SCSI device. The target shall go to the BUS FREE phase following successful receipt of this message. This target shall create a unit attention condition for all initiators (see ANSI SCSI-2 7.9).

COMMAND COMPLETE (Init ← Targ)

The COMMAND COMPLETE message is sent from a target to an initiator to indicate that the execution of an I/O process has completed and that valid status has been sent to the initiator. After successfully sending this message, the target shall go to the BUS FREE phase by releasing the BSY signal. The target shall consider the message transmission to be successful when it detects the negation of ACK for the COMMAND COMPLETE message with the ATN signal false.

DISCONNECT (Init ← Targ)

The DISCONNECT message is sent from a target to inform an initiator that the present connection is going to be broken (the target plans to disconnect by releasing the BSY signal), but that a later reconnect will be required in order to complete the current I/O process. This message shall not cause the initiator to save the data pointer. After successfully sending this message, the target shall go to the BUS FREE phase by releasing the BSY signal. The target shall consider the message transmission to be successful when it detects the negation of the ACK signal for the DISCONNECT message with the ATN signal false.

Targets which break data transfers into multiple connections shall end each successful connection(except possibly the last) with a SAVE DATA POINTER - DISCONNECT message sequence.

If the target receives the DISCONNECT message from the initiator, the target shall respond by sending a MESSAGE REJECT message to the initiator.

IDENTIFY (Init → Targ)

The IDENTIFY message(Table 3.86) is sent by either the initiator or the target establish an I_T_L nexus.

Table 3.86 IDENTIFY message

Bit	7	6	5	4	3	2	1	0
	Identify	DiscPriv	LUNTAR	Reserved	Reserved	LUNTRN		

The Identify bit shall be set to one to specify that this is an IDENTIFY message.

A disconnect privilege (DiscPriv) bit of one indicates that the initiator has granted the target the privilege of disconnecting. A DiscPriv bit of zero specifies that the target shall not disconnect. This bit is not defined and shall be set to zero when an IDENTIFY message is sent by a target.

A logical unit target (LUNTAR) bit of zero specifies that the I/O process is directed to or from a logical unit. A LUNTAR bit of one specifies that the I/O process is directed to or from a target routine. This scanner supports direction to logical unit, LUNTAR bit is zero, only.

The logical unit number target routine number (LUNTRN) field specifies a logical unit number if the LUNTRN bit is zero. The response to an invalid value in the LUNTRN field is described in ANSI SCSI-2 7.5.3.

An IDENTIFY message is invalid if a reserved bit is set to one or if the LUNTAR bit is set to one, this scanner may respond to an invalid IDENTIFY message by immediately sending a MESSAGE REJECT message.

An implied RESTORE POINTERS message shall be performed by the initiator prior to the assertion of the ACK signal for the next phase for an inbound IDENTIFY message sent during reconnection.

An implied RESTORE POINTERS message shall be performed by the initiator following successful identification of the nexus during the MESSAGE IN phase of reconnection and before the negation of the ACK signal for the next transfer following the successful identification.

INITIATOR DETECTED ERROR (Init → Targ)

The INITIATOR DETECTED ERROR message is sent from an initiator to inform a target that an error has occurred that does not preclude the target from retrying the operation. The source of the error may either be related to previous activities on the SCSI bus or may be internal to the initiator and unrelated to any previous SCSI bus activity. Although present pointer integrity is not assured, a RESTORE POINTERS message or a disconnect followed by a reconnect, shall cause the pointers to be restored to their defined prior status.

MESSAGE PARITY ERROR (Init → Targ)

The MESSAGE PARITY ERROR message is sent from the initiator to the target to indicate that it received a message byte with a parity error (see ANSI SCSI-2 6.2.1).

In order to indicate its intentions of during this message, the initiator shall assert the ATN signal prior to its release of the ACK signal for the REQ/ACK handshake of the message byte that has the parity error. This provides an interlock so that the target can determine which message byte has the parity error. If the target receives this message under any other circumstance, it shall signal a catastrophic error condition by releasing the BSY signal without any further information transfer attempt.

If after receiving the MESSAGE PARITY ERROR message the target returns to the MESSAGE IN phase before switching to some other phase, the target shall re-send the entire message that had the parity error.

MESSAGE REJECT (Init ↔ Targ)

The MESSAGE REJECT message is sent from either the initiator or target to indicate that the last message or message byte it received was inappropriate or has not been implemented.

In order to indicate its intentions of sending this message, the initiator shall assert the ATN signal prior to its release of the ACK signal for the REQ/ACK signal for the REQ/ACK handshake of the message byte that is to be rejected. If the target receives this message under any other circumstance, it shall reject this message.

When a target sends this message, it shall change to MESSAGE IN phase and send this message prior to requesting additional message bytes from the initiator. This provides and interlock so that the initiator can determine which message byte is rejected.

After a target sends a MESSAGE REJECT message and if the ATN signal is still asserted, then it shall return to the MESSAGE OUT phase. The subsequent MESSAGE OUT phase shall begin with the first byte of a message.

NO OPERATION (Init → Targ)

The NO OPERATION message is sent from an initiator in response to a target's request for a message when the initiator does not currently have any other valid message to send.

For example, if the target does not respond to the attention condition until a later phase and at that time the original message is no longer valid the initiator may send the NO OPERATION message when the target enters the MESSAGE OUT phase.

RESTORE POINTERS (Init ← Targ)

The RESTORE POINTERS message is sent from a target to direct the initiator to copy the most recently saved command, data, and status pointers for the I/O process to the corresponding current pointers. The command and status pointers shall be restored to the value at the beginnings of the data area in the absence of SAVE DATA POINTER message or to the value at the point at which the last SAVE DATA POINTER message occurred for that nexus.

This scanner sends this message only when received a INITIATOR DETECTED ERROR during image data transfer.

SAVE DATA POINTER (Init ← Targ)

The SAVE DATA POINTER message is sent from a target to direct the initiator to copy the current data pointer to the saved data pointer for the current I/O process.(ANSI SCSI-2 6.4 for a definition of pointers.)

SYNCHRONOUS DATA TRANSFER REQUEST

Table 3.87 SYNCHRONOUS DATA TRANSFER REQUEST

Bit Byte	7	6	5	4	3	2	1	0
0	Extended message (01h)							
1	Extended message length (03h)							
2	SYNCHRONOUS DATA TRANSFER REQUEST code (01h)							
3	Transfer Period Factor							
4	REQ/ACK Offset							

A SYNCHRONOUS DATA TRANSFER REQUEST (SDTR) message (Table 3.87) exchange shall be initiated by an SCSI device whenever a previously arranged data transfer agreement may have become invalid. The agreement becomes invalid after any condition which may leave the data transfer agreement in an indeterminate state such as:

a) after a hard reset condition;

b) after a BUS DEVICE RESET message and;

c) after a power cycle.

In addition, an SCSI device may initiate an SDTR message exchange whenever it is appropriate to negotiate a new data transfer agreement (either synchronous or asynchronous). SCSI devices that are capable of synchronous data transfers shall not respond to an SDTR message with a MESSAGE REJECT message.

The SDTR message exchange establishes the permissible transfer periods and the REQ/ACK offsets for all logical units on the two devices. This agreement only applies to data phases.

Transfer Period Factor: 62(4MB/s max.) to 255

The transfer period factor times four is the value of the transfer period. The transfer period is the minimum time allowed between leading edges of successive REQ pulses and of successive ACK pulses to meet the device requirements for successful reception of data.

REQ/ACK Offset: 0(Async), 1 to 8

The REQ/ACK offset is the maximum number of REQ pulses allowed to be outstanding before the leading edge of its corresponding ACK pulse is received at the target. This value is chosen to prevent overflow conditions in the device's reception buffer and offset counter. A REQ/ACK offset value of zero shall indicate asynchronous data transfer mode; a value of FFh shall indicate unlimited REQ/ACK offset.

The originating device (the device that sends the first of the pair of SDTR message) sets its values according to the rules above to permit it to receive data successfully. If the responding device can also receive data successfully with those values (or smaller transfer periods or larger REQ/ACK offsets or both), it returns the same values in its SDTR message. If it requires a larger transfer period, a smaller REQ/ACK offset, or both in order to receive data successfully, it substitutes values in its SDTR message as required, returning unchanged any value not required to be changed. Each device when transmitting data shall respect the limits set by the other's SDTR message, but it is permitted to transfer data with larger transfer periods, smaller REQ/ACK offsets, or both than specified in the other's SDTR message. The successful completion of an exchange of SDTR message implies an agreement as follows:

Responding Device SDTR response	Implied Agreement
1) Non-zero REQ/ACK offset	Each device transmits data with a transfer period equal to or greater than and a REQ/ACK offset equal to or less than the values received in the other device's SDTR message.
2) REQ/ACK offset equal to zero	Asynchronous transfer
3) MESSAGE REJECT message	Asynchronous transfer

See ANSI SCSI-2 6.6.21 for details of SYNCHRONOUS TRANSFER REQUEST message.

Command Sequence

This chapter describes about command and phase sequence related to host system. SCSI-2 introduced PHASE, MESSAGE system, etc., for interfacing other than simple command passing, therefore, a lot of sequences can be considerable. Below shows some typical case and out recommendations of implementation SCSI protocol to the system.

System Initialization

The following list of information is assumed necessary and sufficient for normal system initialization:

1) A list of each installed and powered on SCSI device for each SCSI address. SCSI devices that are not powered on are treated as not installed, assuming that the terminators are powered from a source other than unexpected SCSI devices.

2) A list of the installed logical units for each SCSI device. Unpowered or failing logical units may not be completely identifiable.

3) The device type for each available logical unit.

4) The manufacturer and model for each available logical unit. (this information may not be available for SCSI-1 devices)

5) The critical device type information for each available logical unit.

6) This information varies depending on the device type.

7) Extended functionality of SCSI devices such as target role capability in

8) devices that are principally initiators, AEN capability, etc.

The following states are established for each attached logical unit that has power available and is not failing:

1) The ready state for each available logical unit, including any required medium initialization, but not initialization, but not formatting.

2) All error conditions associated with the starting process are cleared.

3) All UNIT ATTENTION conditions are cleared.

4) All data transfer parameters are established.

5) All pertinent system tuning parameters are established where known. Note that these may be modified dynamically to improve the performance characteristics of the system.

The following procedures show the sequences necessary to implement a system that initializes itself with a minimum of information available at power on time. Many real systems are not so generalized, having considerable information available about the proper configuration at power-on time. In those cases, the sequence steps that would have been necessary to obtain that predefined information may be skipped or ignored.

General Procedure for Initializing Devices

Initiator Activities:

Power On: It is assumed that each SCSI device, as it is powered on, performs appropriate internal reset operations and internal test operations. Once powered on, initiators that have target capability should be prepared to respond to a selection within a system-specific time.

Reset: At power-on time, it is likely that an SCSI device has caused errors to the ongoing activities on the SCSI bus. A bus reset should be generated to notify attached devices that any activities that may have been occurring should be restarted .

Find Device: Each SCSI address other than the initiator's SCSI address should be tested to determine if an SCSI device responds. If an SCSI device responds, an INQUIRY command to logical unit 0 should be executed. The information obtained indicates the device type, manufacturer, and model of the attached logical unit 0 if the response data format field is one or two. If the response data format field is zero, only the device type field is valid. In addition, the version of command set supported by the device is indicated by the ANSI-approved version field.

Find logical units: Each possible logical unit number on the attached targets should be tested for experience using an INQUIRY command. Those found with a non-zero peripheral qualifier in the INQUIRY data should not be included in the list of available logical units. Each available logical unit should be added to the host configuration information, identifying the associated logical unit number, device type, manufacturer, and model.

Verify State: The verify state test should be made to clear any outstanding errors, capture and clear UNIT ATTENTION conditions, and determine the state of readiness of the available logical units. The logical units should be identified as ready, not ready, or failing by this test.

Device Initialization: The device undergoes a device-dependent initialization process. This process is described for direct-access devices, sequential-access devices, and processor devices. Other device initialization procedures are not described since they tend to be similar to one of these initialization procedures. The initialization process takes into account the state of the device as identified during the verify state test.

Device On-line: The successful completion of the device initialization process allows the device-table entry to be fully enabled. The device joins the system with all key parameters identified and initialized. The device state is known and may be presented to the system operator.

Verify State Test

The verify state test uses the following steps to identify any outstanding errors, clear any UNIT ATTENTION conditions, and determine the readiness of the devices. The verify state test should be executed against each available logical unit.

TEST UNIT READY(1)

GOOD — CHECK CONDITION

exit: LOGICAL UNIT READY — REQUEST SENSE (2)

TEST UNIT READY (3)

GOOD — CHECK CONDITION

exit: LOGICAL UNIT READY — REQUEST SENSE (4)

TEST UNIT READY (5)

GOOD — CHECK CONDITION

exit: LOGICAL UNIT READY

REQUEST SENSE (6)

NOT READY — OTHER CHECK

exit: LOGICAL UNIT READY — exit: LOGICAL UNIT FAILED
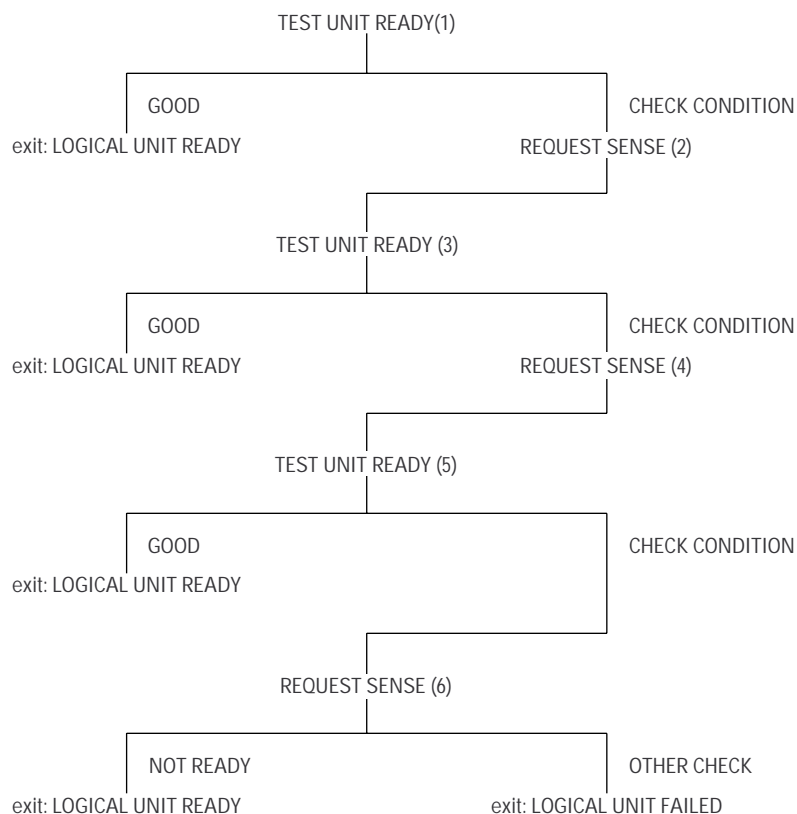
Figure 3.6 Verify State Test

TEST UNIT READY (1):

This TEST UNIT READY command is used to determine if any outstanding CHECK CONDITION or UNIT ATTENTION condition exists. If not, the device is indicated to be ready.

REQUEST SENSE (2):

This REQUEST SENSE command is used to clear the outstanding CHECK CONDITION. Most SCSI-2 logical units return UNIT ATTENTION sense key in this sense information.

TEST UNIT READY (3):

This TEST UNIT READY command is used to see if the UNIT ATTENTION condition or other error was successfully cleared. In some special cases, another error may have been nested with the UNIT ATTENTION and this TEST UNIT READY command may also return CHECK CONDITION status.

REQUEST SENSE (4):

This REQUEST SENSE command is used to determine which error or exception was associated with the CHECK CONDITION status returned by the TEST UNIT READY (3) command. In addition, this REQUEST SENSE command is used to clear the outstanding CHECK CONDITION. This may be a NOT READY sense key or another unexpected error.

TEST UNIT READY (5):

This TEST UNIT READY command is used to see if all outstanding CHECK CONDITION statuses have finally been cleared. If so, the logical unit is identified as ready.

REQUEST SENSE (6):

This REQUEST SENSE command is used to determine why there is a persistent CHECKCONDITION status. If the sense key indicates some other failure, the logical unit is identified as failing and the sense key is logged in the appropriate area. IMPLEMENTORS NOTE: Commands that receive BUSY or RESERVATION CONFLICT status should be re-issued until some other status is received.

Scanning Sequence

Basic Scanning Sequence (Simplex Mode) :

RESERVE UNIT	Reserve exclusive use of the scanner.
SET WINDOW(ID:00h)	Specify document scanning parameter.
SEND	Send "Halftone Mask" and/or "Gamma Function" data, if required.
OBJECT POSITION (Load Object)	Feed document into ADF. This command is omissible because SCAN or READ command automatically feeds in a document.
SCAN(ID:00h)	Start scanning operation. This command is omissible because READ command automatically starts scanning.
READ	Transfer image data from scanner. READ command would be issued one or more. The details of READ command sequence is 4.9.5.
OBJECT POSITION (Unload Object)	Feed out document from ADF. This command is omissible because end of scanning automatically feeds out document.
RELEASE UNIT	Release exclusive use of the scanner.

1　This loop is used to scan a batch of document.

2　This loop is used to scan a batch of identical format document at maximum speed.

Duplex Scanning

The duplex scanning is extension of simplex mode scanning.

For duplex scanning, SET WINDOW command must specify front side window (window identifier 00h) and back side window (window identifier 80h) in window descriptor. SCAN command is required to invoke duplex mode scanning by sending window identifier 00h, 80h in data out phase. READ command is issued to read image data sequentially front window and back window. In the READ command, window identifier field must be specified in data type qualifier field to distinguish which side of window data is read. When front image data is completely read, back image data can be read in this scanner.

RESERVE UNIT	Reserve exclusive use of the scanner.
SET WINDOW(ID:00h,80h)	Specify window parameters for front side(00h) and back side(80h). The window parameters must be sent in one SET WINDOW command.
SEND	Send "Halftone Mask" and/or "Gamma Function" data, if required.
OBJECT POSITION (Load Object)	Feed document into ADF. This command is omissible because SCAN or READ command automatically feeds in a document.
SCAN(ID:00h,80h)	Start scanning operation. This command is required to specify duplex mode scanning. The window identifiers should be sent in 00h, 80h order for future extention.
READ(ID:00h)	Transfer front side(Data Type Qualifier:0000h) image data from scanner. READ command would be issued one or more. The details of READ command sequence is 4.9.5.
READ(ID:80h)	Transfer back side(Data Type Qualifier:0080h) image data from scanner. READ command would be issued one or more. The details of READ command sequence is 4.9.5.
OBJECT POSITION (Unload Object)	Feed out document from ADF. This command is omissible because end of scanning automatically feeds out document.
RELEASE UNIT	Release exclusive use of the scanner.

1   This loop is used to scan a batch of document.

2   This loop is used to scan a batch of identical format, window parameter document at maximum speed.

Endorser Control

The Endorser Control requires Endorser option. This endorser function is assumed that a batch of documents are scanned and each document is printed serial number. Therefore, ENDORSER command just only specifies start and stop of endorsement and does not interfere with scanning command sequence. Endorser Data is sent to scanner a head of issuing ENDORSER command. The endorser function is invoked by READ command internally. Following shows simplex mode sequence. For Duplex mode, refer to 3.9.4.2.

Command	Description
RESERVE UNIT	Reserve exclusive use of the scanner.
SEND(Endorser Data)	Send "Endorser Data".
ENDORSER(Start)	Start endorser function by sending identifier with STOP bit 0.
SET WINDOW(ID:00h)	Specify document scanning parameter.
SEND	Send "Halftone Mask" and/or "Gamma Function" data, if required.
OBJECT POSITION (Load Object)	Feed document into ADF. This command is omissible because SCAN or READ command automatically feeds in a document.
SCAN(ID:00h)	Start scanning operation. This command is omissible beacuse READ command automatically starts scanning.
READ	Transfer image data from scanner. READ command would be issued one or more. The details of READ command sequence is 4.9.5.
OBJECT POSITION (Unload Object)	Feed out document from ADF. This command is omissible because end of scanning automatically feeds out document.
ENDORSER(Stop)	Stop endorser function by sending identifier with STOP bit 1.
RELEASE UNIT	Release exclusive use of the scanner.

1   This loop is used to scan a batch of document.

2   This loop is used to scan a batch of identical format document at maximum speed.

READ command sequences and phase progression

This scanner initially has image buffer memory different from former Fujitsu image scanner M3096G/M3097G.

Notations :

ARB:	ARBITRATION phase
SEL:	SELECTION phase
CMD:	COMMAND phase
DI:	DATA IN phase
MI:	MESSAGE IN phase
MO:	MESSAGE OUT phase
STS:	STATUS phase
BF:	BUS FREE
Init:	Initiator (Host Computer)
Targ:	Target (Image Scanner)

Variables for explanation

TL:	Requested Transfer Length size. [bytes]
WD:	Window Data size defined by SET WINDOW command. [bytes] If compression is specified, the size is compressed data.
VD:	Scanned image data size in scanner memory [bytes] This value is varied on scanning progression.
M:	Transferred data size [bytes]
N:	$N = (VD \text{ div } 65536)$. [bytes]
TD:	Total Data that is transferred. [bytes]

When $TL \geq WD$ at first READ command, it is called 'Single READ' sequence. This scanner has default page buffer memory, therefore, the Single READ is completely subset of Multiple READ. This document has omitted Single READ sequence.

Multiple READ (disconnect disabled)

```
                        ┌─────────────────────┐
                        │        TD=0         │
                        └─────────────────────┘
                                   │
                                   ▼
                        ┌──────┬────────────────┐
                        │ ARB  │ Init           │
                        ├──────┼────────────────┤
                        │ SEL  │ Init.¨Targ      │
                        ├──────┼────────────────┤
                        │ MO   │ IDENTIFY       │
                        ├──────┼────────────────┤
                        │ CMD  │ READ(TL<WD)    │
                        ├──────┼────────────────┤
                        │ DI   │ Image Data(TL) │
                        └──────┴────────────────┘

                        ┌─────────────────────┐
                        │       TD+=TL        │
                        └─────────────────────┘
                                   │
                                   ▼
                               ◇ TD>=WD ◇  ── Yes ──┐
                                   │          ┌──────────┐
                                   │          │  EOM=1   │
                                   │          └──────────┘
                                   ▼
                               ◇ TD<=WD ◇  ── Yes ────────────────────┐
                                   │ No
                                   ▼
```

STS	CHECK CONDITION
MI	COMMAND COMPLETE
BF	

STS	GOOD
MI	COMMAND COMPLETE
BF	

Read End
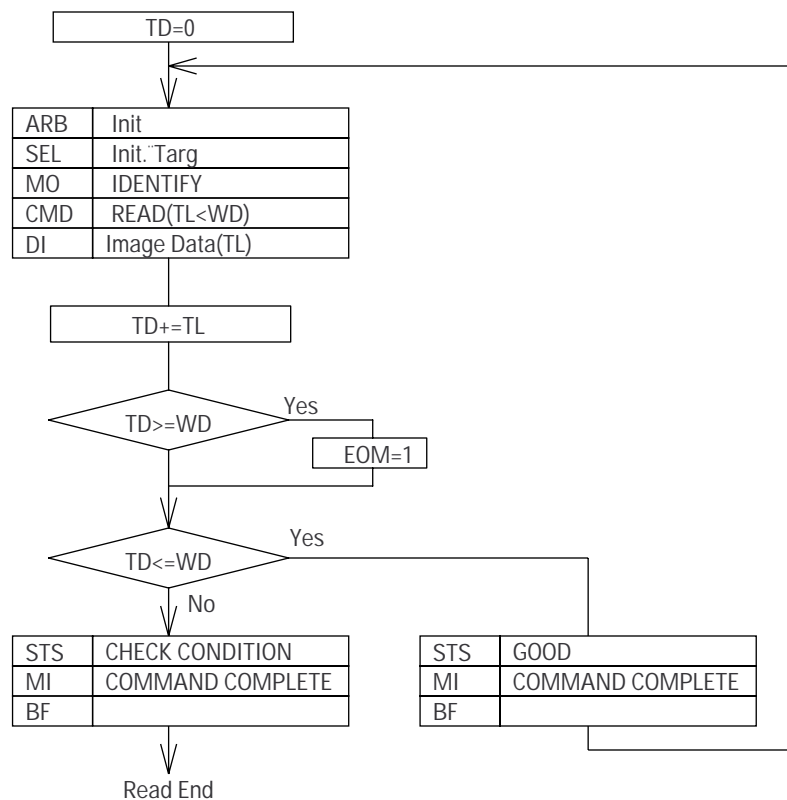
See Note 1, 2.

Multiple READ (disconnect enabled)

This sequence is intended for system which scans one page document dividing small quantity of data reading and saving to storage.
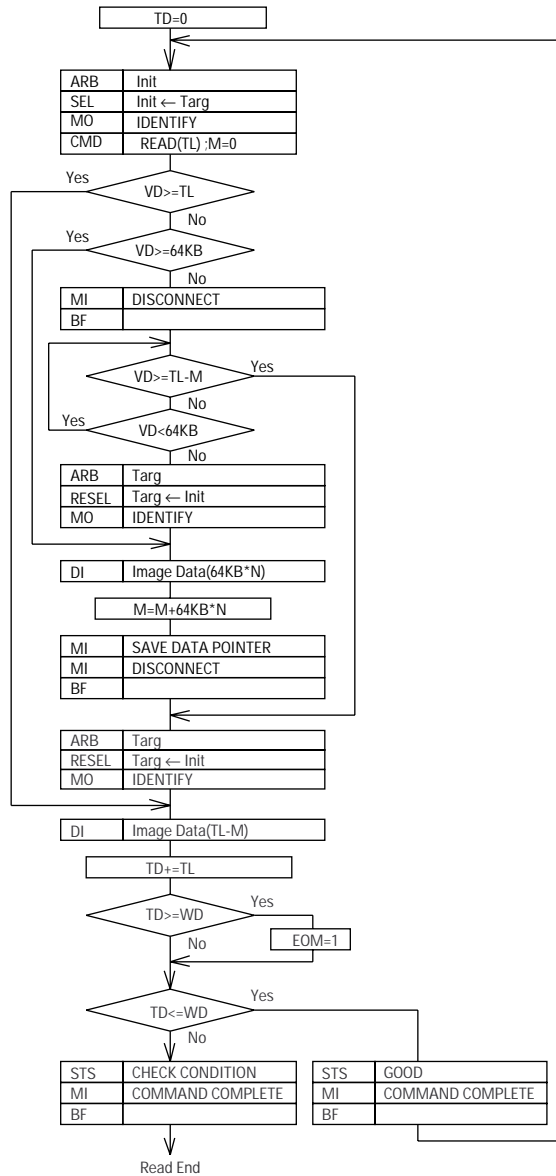
See Note 1, 2.

Notes: 1. If the requested Transfer Length does not equal to actually transferred data size, the scanner returns CHECK CONDITION status and create Sense Data as bellow.

ILI = 1 :
INFORMATION : TL(requested Transfer Length) - actual transferred data size

This status is sent to the latest READ command. For the other READ commands, the GOOD status will be returned. If requested Transfer Length in last READ command equal to the data size that should be transferred, CHECK CONDITION status will be returned to next READ command.

2. In addition to Note 1, when completion of image data transfer, the scanner sets EOM bit to 1. If initiator issues REQUEST SENSE command for each READ command, Sense Key will be set to NO SENSE but by checking EOM bit completion of transfer can be detected.

EOM = 0 : Image data transfer is not completed.
EOM = 1 : Image data transfer has just completed.

Above specification is described in JBMS but it is not recommended for speed performance reason.

3. After all image data of the window is transferred, CHECK CONDITION status will be returned following each READ commands. To scan another document, issue SET WINDOW command and set window.

4. Enabling or disabling disconnection is depending on IDENTIFY message related to READ command. If bit 6 of IDENTIFY message is 1, disconnection is enabled. If bit 6 of IDENTIFY message is 0, disconnection is disabled.

Status Transition of Logical Unit

Power ON
Reset
BUS DEVICE RESET message

———▷	GOOD status
·····▷	CHECK CONDITION status
⇨	Status transition

UNIT ATTENTION status

INQUIRY command

REQUEST SENSE command
UNIT ATTENTION reported/cleared

Range protected in reserved status

NOT READY status

Time to READY

At room temperature
(25°C): ≤ 60 seconds

At low temperature
(5°C): ≤ 5 minutes

NOT READY status

Other command

REQUEST SENSE
Command
(NOT READY reported)

Normal status

READY status: Waiting

Other command

READ command

Reading

Scan completed

C.A. status

- Hardware error
- Abnormal command
- Abnormal parameter
- Medium error

C.A.status

REQUEST SENSE command
(Error detail reported/cleared)

Other command
(C.A. status released)

Specifiable items for window parameter

Window parameter items has some limitation owing to combination of their mutual functionality. The table below shows such limitations.

Image Composition Item	Line Art	Halftone
X, Y resolution	✓	✓
Upper Left X, Y	✓	✓
Width, Length	✓	✓
Threshold	✓	✓[*1]
Bit Per Pixel	01	01
Halftone Pattern	✓[*1]	✓
RIF(Reverse Image Format)	✓	✓
Outline Extraction	✓[*2]	✓[*3]
Image Emphasis	✓	✓
Automatic Separation	✓[*4]	✓[*4]
Mirror Image	✓	✓
Paper Size	✓	✓
Simplified Dynamic Threshold	✓[*4]	✓[*3]
Dynamic Threshold	✓	
White Level Follower	✓	✓

✓:   Specifiable and effective

✓[*1]:   Effective if automatic separation is specified, otherwise ignored

✓[*2]:   Specifiable, but not effective if image emphasis is specified

✓[*3]:   Specifiable, but not effective

✓[*4]:   Specifiable, but not effective if outline extraction is specified

(blank): Not specifiable

CHAPTER

4

BASIC OPERATION

This chapter provides power switch operation, operator panel arrangement and functions, messages, and replacement of consumables.

Power Switch Operation

The power switch is located at the right side of the scanner.

Figure 4.1 shows switch location.
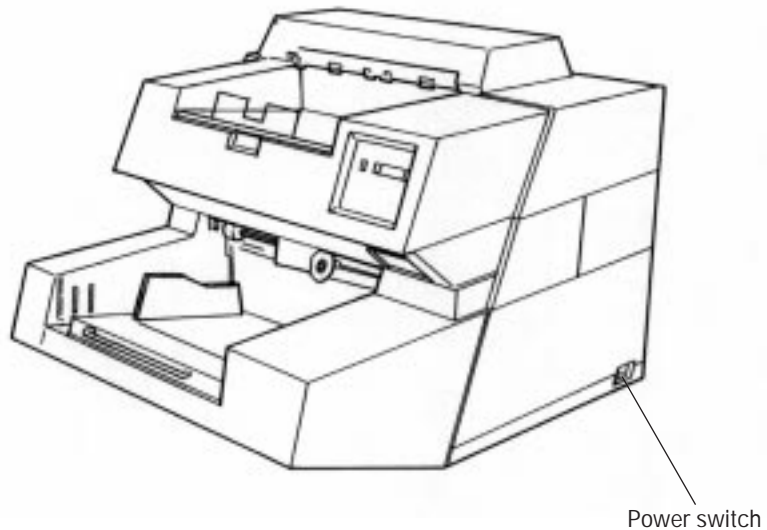
Power switch

Figure 4.1 Power switch location

Opening the Upper Transport Unit

Operator panel

Lever

Jammed document
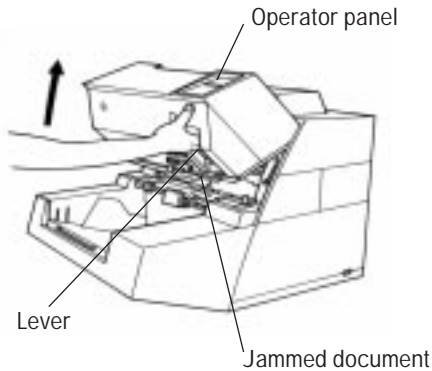
1   Lift the lever below the operator panel to open the upper transport unit from under.

WARNING
Make sure that the upper transport unit is engaged in the "LIFT-up" position on the "LIFT-up" latch.

Closing the Upper Transport Unit

Operator panel

Lever

Jammed document
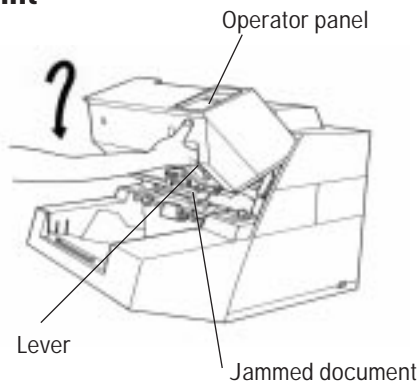
1   Lift-up the upper transport unit with both of your hands to release the "LIFT-up" latch and then to lower down the upper transport unit with your hands.

WARNING
Before lowering down the unit, make sure that the area between the main machine and the upper transport unit is clear of all objects and fingers.

NOTICE
Press the upper transport unit with both hands to secure the lock.
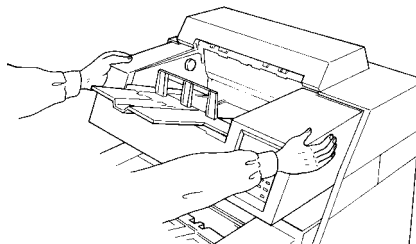
Operator Panel   The operator panel is located at right side in front view of this device. The operator panel consists of an LCD display (24 columns × 2 lines), 3 LEDs and 5 buttons.

Figure 4.2 shows layout of operator panel.
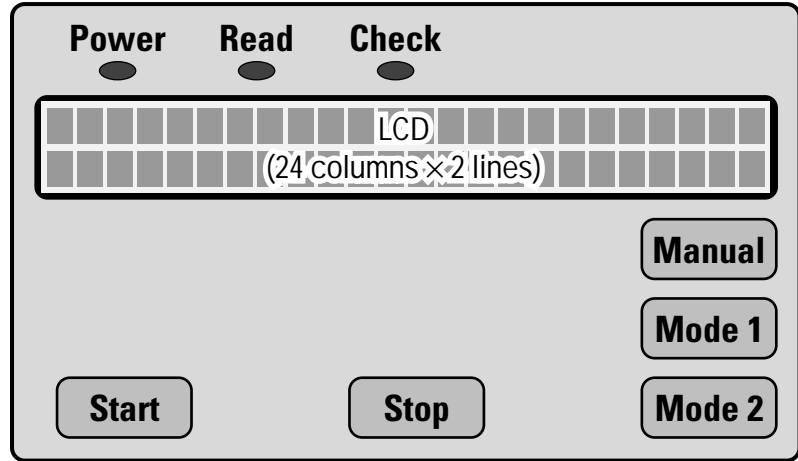
Figure 4.2   Operator panel layout

Operator panel function

Table 4.1 lists button functions, and Table 4.2 lists LED functions.

Table 4.1 Button functions

Button name	Function
Start	This button is used to indicate 'Start' to scanner in TEST mode or SETUP mode at Off-line. This button is disabled while scanner operates in On-line.
Stop	This button is used to indicate 'Start' to scanner in TEST mode or SETUP mode at Off-line. This key is used to cancel temporary error while operating at On-line. This key is used to lower the hopper table to the bottom during waiting for Hopper-Timer. This key is used to display the abrasion counter during displaying the ready screen.
Manual	This button is used to select manual feeding mode. By pressing this key, setting is switched between manual feeding and ADF mode.
Mode 1	This button is used to start Off-line SETUP mode with Power switch. This button is used to select item in Off-line SETUP mode.
Mode 2	This button is used to start Off-line TEST mode with Power switch. This button is used to select item in Off-line SETUP mode.

Table 4.2 LEDs function

LED	Color	Function
Power	Green	When Power switch is turned on, this LED is turned on.
Read	Green	While scanning, this LED is turned on.
Check	Yellow	The scanner mulfunction is detected, this LED is turned on. When temporary error (Paper Jam, and so on) is detected, this LED is blinked. Temporary error is cleared and Stop button is pressed, this LED will be turned off.

LCD display

When the Power switch is turned on following messages are displayed on LCD at On-line.

Power-On to Ready

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
			W	a	r	m	i	n	g	-	u	p		N	o	w	!	!					

Operation Ready

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
						S	c	a	n	n	e	r		R	e	a	d	y					

Operation Ready in Manual Feed mode

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
						M	a	n	u	a	l		F	e	e	d							
						S	c	a	n	n	e	r		R	e	a	d	y				

Warning

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
						I	N	K		E	M	P	T	Y								

The lower line is blinking and displays the ink empty of print head after the scanning operation. This warning display will be reset, when the covers are opened, or [STOP] is pressed, or Start command is issued. The operator must change the print head and reset the ink counter.

Paper Counter

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
						S	c	a	n	n	e	r		R	e	a	d	y			X	X	X

Reading counter

The counter of reading paper is displayed in a batch of the reading operation.

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
						S	c	a	n	n	e	r		R	e	a	d	X	X	X	X	X	X

Abrasion counter

The abrasion counter is displayed after pressing [STOP] switch in the Ready screen.

In following case, the display of counter is deleted.
• The next Start Command is issued.
• The valid switches are pressed.
• The error is cleared.

IPC II pre-set mode

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
*						S	c	a	n	n	e	r		R	e	a	d	y					

When IPC II pre-set mode is set, an asterisk (*) is displayed. The method of IPC II pre-set mode is show in setup mode.

Buttons

[Manual] button

This button is used to select manual feed mode. By pressing this button, setting is switched between Manual mode and ADF mode.

By pressing this button, scanner goes to manual feed mode and the hopper elevates. The next pressing this button, scanner exit from manual feed mode and the hopper down.

[Start]/[Stop] button

This button are used in Off-line mode. By pressing Start button in Off-line mode, the scanner starts document feeding. By pressing Stop button in Off-line mode, the scanner stops document feeding.

The Stop button is also used in On-line mode to cancel temporary error condition.

[Mode 1] button

This button is used to transit to Off-line SETUP mode when Power-on. By pressing Mode 1 button and turn on the Power switch, this scanner starts up in SETUP mode.

[Mode 2] button

This button is used to transit to Off-line TEST mode when Power-on. By pressing Mode 2 button and turn on the Power switch, this scanner starts up in TEST mode. The TEST mode is used for maintainance/diagnostic purpose. Functions are described in M3099G IMAGE SCANNER CE MANUAL.

Message List

Table 4.3 lists the messages indicating scanner statuses, temporary errors, and equipment errors in the On-line mode. The error conditions and how to recover are described in Chapter 5. ERROR PROCESSING AND RECOVERY.

Table 4.3 Messages

Item	Message
Power-On	Warming-up Now!!
Ready	Scanner Ready
Warning	INK EMPTY[*1)
Temporary errors	PAPER JAM
	HOPPER EMPTY
	COVER OPEN
	MISS PICK
	ROLLER UNIT NOT SET
	PRINT HEAD NOT SET[*1)
	PRINT HEAD ALARM[*1)
	HOPPER OVERLOAD
Equipment errors	HOPPER ALARM
	TRANSPORT ALARM
	LAMP ALARM 1
	HEATER ALARM 1
	LAMP ALARM 2
	HEATER ALARM 2
	CCD UNIT ALARM 1
	CCD UNIT ALARM 2
	TEMP ALARM
	FUSE ALARM PRINT
	RAM ALARM PRINT[*1)
	TIME-OUT ALARM PRINT[*1)
	HARDWARE ALARM

*1) These messages are displayed when ENDORSER option is used.

Loading Document

This section provides how to load documents.

When the LCD display on the operator panel has displayed "Hopper Empty", supply documents as follows:

Guide

Hopper table
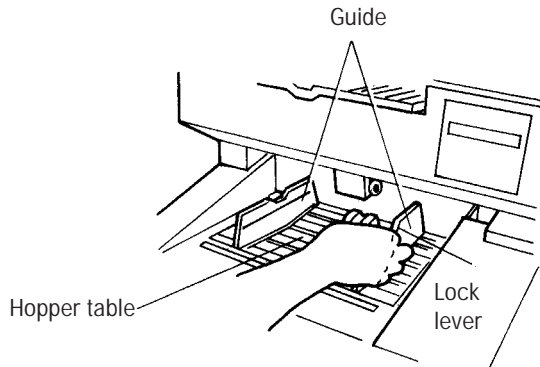
Lock lever

① Set the specified document width.

Hold the lock lever at the guide center on the right of the hopper table and move it horizontal to set the document width.

Line mark

Document

Extension Hopper table
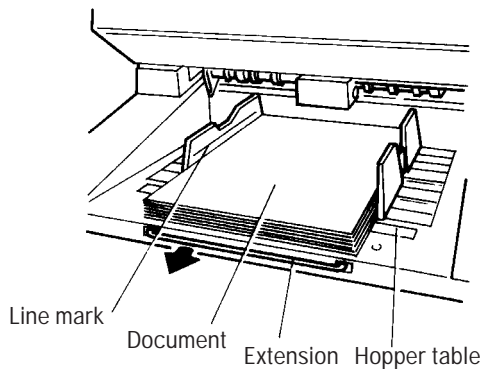
② Load a document read side face-up on the hopper table.

Note:
1. Be sure not to load documents higher than the line marked inside the guide on each side of the hopper table.

2. If the documents are too long, pull out the extension at the front of the hopper.

Lever

Stacker

Stacker table

Document

Stopper

Stopper

Document

about 20 mm
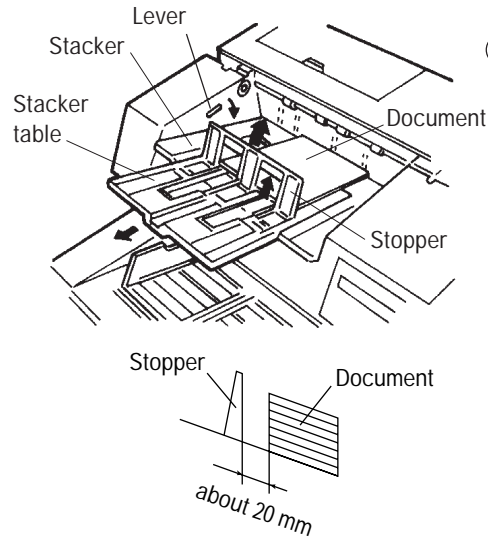
③ Adjust the stacker table to the document size.

Note:
Extend the stacker table and extension for long documents. Stand and extend the stopper up and also turn the lever in the stacker down for short documents.
If the scanner is 500 sheets hopper type, extend the stacker table for long documents. And also use stopper for small documents.
Load a document about 20 mm a part from the stopper.

Lamp Replacement

The scanner has two lamps, one for front-side reading and other for back-side reading. Replace the lamps as follows:

WARNING
Never replace lamp without turning off the power.

WARNING
Wait at least 3 minutes after turning off the power before touching the lamp.

Replacing the front-side lamp

Upper transport unit   Operator panel

Lever   Power switch

1. Turn off the power switch.

2. Open the upper transport unit. (See page 4-2)

Lamp socket covers

3. Remove the two lamp socket covers (U-shaped spring clips) by pulling them out of their positions.

Upper transport unit

Lamp

4. Rotate the lamp so that the two terminals on each and align with the exit slot on the lamp socket.
   Maintain the alignment and remove the lamp from the lamp sockets.

Wire of the heater

CAUTION
Be careful not to pull the wire of the heater hard.

⑤ Separate the C-shaped heater assembly from the lamp body gently.

CAUTION
- **Be careful not to peel the tape on the heater assembly.**

- **If any visible damage on the heater assembly is observed, please contact manufacturer's authorized service center for proper repair service.**

Window: transparent part
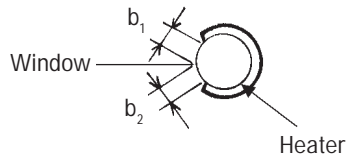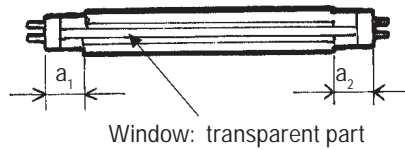
Cross-sectional view of lamp and heater

⑥ Re-attach a new lamp to the C-shaped heater.

Note:
Position the lamp so that the following lengths are the same:
$a_1 = a_2$
$b_1 = b_2$
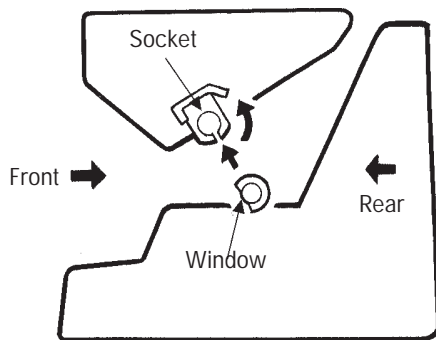
⑦ To re-install lamp/heater, reverse procedures in item ④ above.

Note:
When re-stalling the lamp, make sure to rotate the lamp in the direction as shown in the left figure.

⑧ Close the upper transport unit. (See page 4-2)

Replacing the back-side lamp

Side cover   Power switch
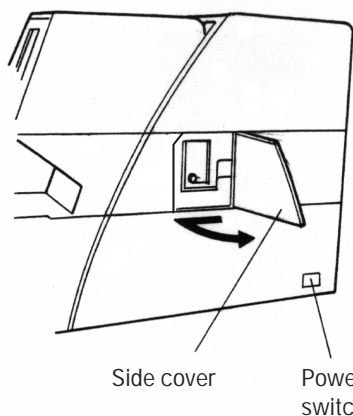
① Turn off the power switch.

② Slide and open the side cover (small cover on the center of the right cover).

Thumb screw
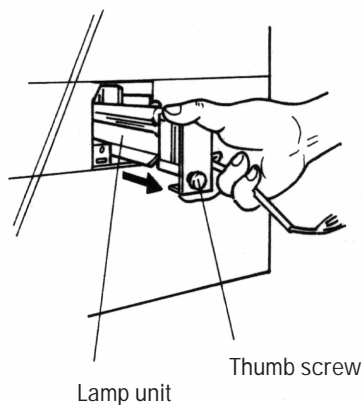
Lamp unit

③ Turn the thumb screw to unlock the lamp unit and pull the unit out of the machine.

Lamp

Wire of the heater

Heater

Lamp unit
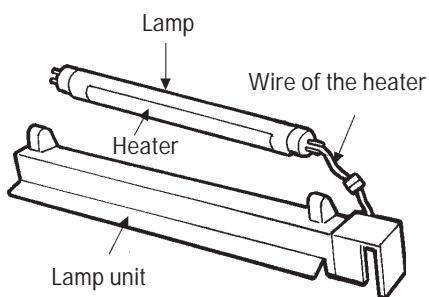
④ Rotate the lamp so that the two terminals on each end align with the exit slot on the lamp socket.

Maintain the alignment and remove the lamp from the lamp sockets.

CAUTION
Be careful not to pull the wire of the heater hard.

⑤ Separate the C-shaped heater from the lamp body gently.

CAUTION
- **Be careful not to peel the tape on the heater.**

- **If any visible damage on the heater is observed, please contact manufacturer's authorized service center for proper repair service.**

Window: transparent part

Cross-sectional view of lamp and heater

⑥ Re-attach a new lamp to the C-shaped heater.

Note:
Position the lamp so that the following lengths are the same:
$a_1 = a_2$
$b_1 = b_2$

Window → ⑧

Socket
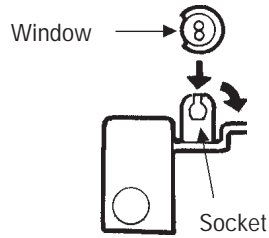
⑦ To re-install lamp/heater, reverse procedures in item ④ above.

Note:
Make sure to rotate lamp in the direction as shown in the left figure.
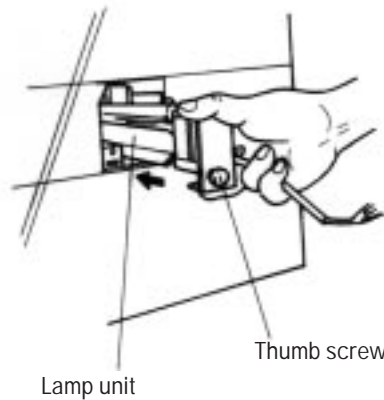
⑧ Align the lamp unit with the grooves on the machine and insert the lamp unit completely. Then, turn the thumb screw completely to avoid cover open error.

⑨ Attach the side cover.

Thumb screw

Lamp unit

Roller ASY Replacement

Replace the roller ASY as follows:

WARNING
Wait at least 3 minutes after turning off the power before replacement.
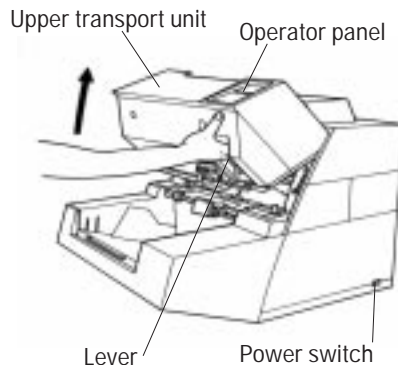
Upper transport unit   Operator panel

Lever   Power switch

① Turn off the power switch.

② Open the upper transport unit. (See page 4-2)

Lever (green)
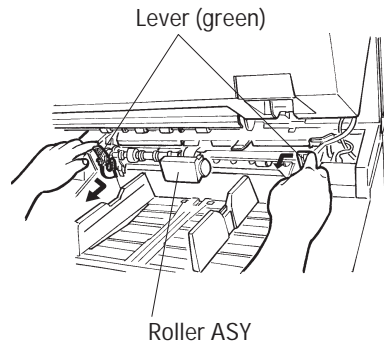
Roller ASY

③ Disconnect the two relay connectors on the roller ASY. (front: 3 pin, back: 2pin)

④ Push the two levers (green) towards each other to disengage with the upper locking holes and lower down the two levers until they engage with the two levers locking holes.

Document sensor unit
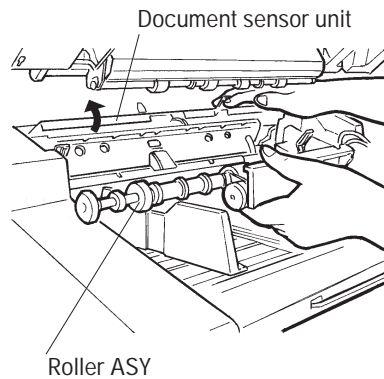
Roller ASY

⑤ Lift the document sensor unit and keep it at the upper position with one hand and pull the roller ASY out with the other hand.

⑥ Install a new roller ASY and return the document sensor unit to its original position.

Lever (green)
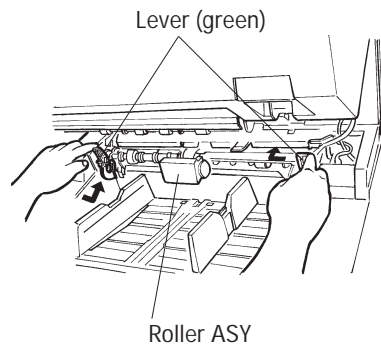
Roller ASY

⑦ Push the two levers (green) towards each other to disengage with the lower locking holes and lift them up until they engage with the two upper locking holes.

⑧ Connect the two relay connectors on the roller ASY. (front: 3 pin, back: 2 pin)

⑨ Close the upper transport unit. (See page 4-2)

Pick Roller Replacement

Replace the pick roller as follows:

Upper transport unit

Operator panel

Lever

Power switch

① Turn off the power switch.

② Open the upper transport unit. (See page 4-2)

Pick roller

Pick roller section
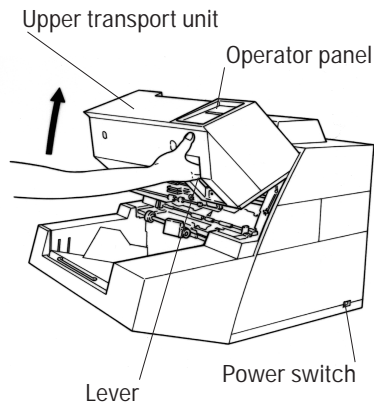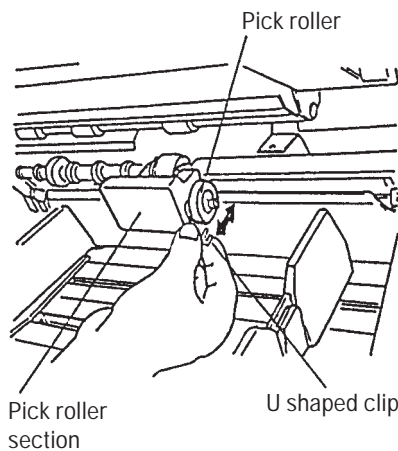
U shaped clip

③ Put off U shaped clips on both ends of the pick roller shaft. Pull the pick rollers outward each other to remove.

④ Install a new pick rollers and put the U shaped clips on the pick roller shaft.

⑤ Close the upper transport unit. (See page 4-2)
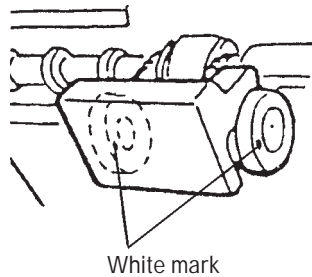
NOTICE
When you install pick rollers, make sure that the white marks on the side of the both pick rollers be in the right-hand side of the scanner.

White mark

Belt Replacement

Replace the belt as follows:

WARNING
Wait at least 3 minutes after turning off the power before replacement.
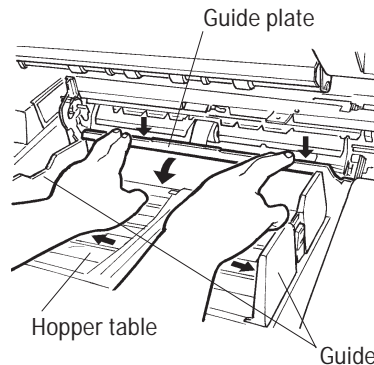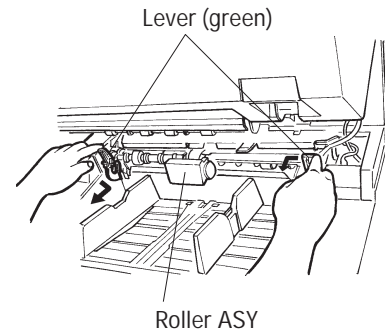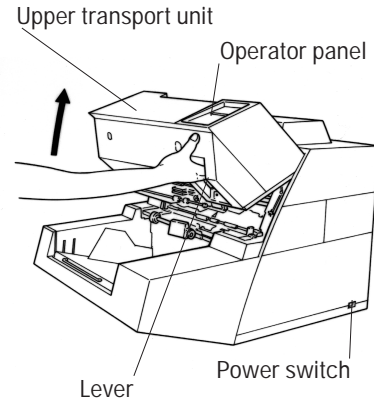
Upper transport unit

Operator panel

Lever

Power switch

① Turn off the power switch. Make sure that the hopper table is at the bottom.

② Open the upper transport unit. (See page 4-2)

Lever (green)

Roller ASY

③ Disconnect the two relay connectors on the roller ASY.

④ Push the two levers (green) towards each other to disengage with the upper locking holes and lower down the two levers until they engage with the two levers locking holes.

Guide plate

Hopper table

Guide

⑤ Lift the document sensor unit and keep it at the upper position with one hand and pull the roller ASY out with the other hand.

⑥ Move the guide on the hopper table completely to the end.
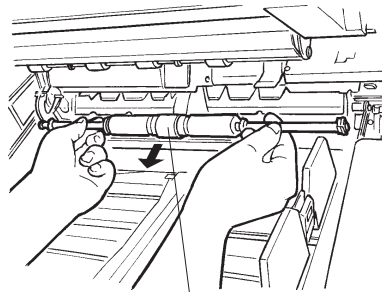
Belt ASY

(7) Hold both ends of the guide plate and press them down to remove the guide.

(8) Pull out the belt ASY.
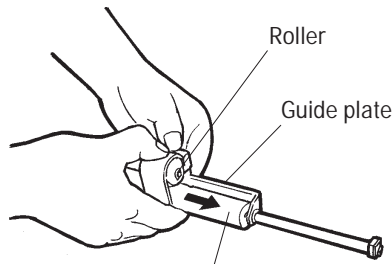
Roller

Guide plate

Belt ASY

(9) Separate the belt roller and shaft from the guide plate.

(10) Detach the belt from the roller.

Bracket

Belt   Roller
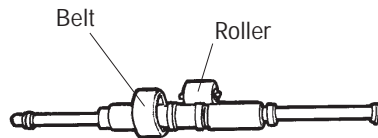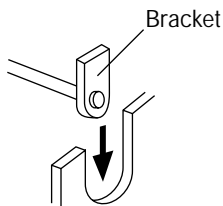
(11) Mount a new belt by following step (7) to (10) in reverse. Align the bracket on the shaft as shown in the figure.

(12) Lift the document sensor unit and keep it at the upper position with one hand and pull the roller ASY out with the other hand.

(13) Close the document sensor unit downward.

(14) Push the two levers (green) towards each other to disengage with the lower locking holes and lift them up until they engage with the two upper locking holes.

(15) Connect the two relay connectors on the roller ASY.

(16) Close the upper transport unit. (See page 4-2)

BASIC
OPERATION

Pad Replacement

Replace the pad as follows:

WARNING
Wait at least 3 minutes after turning off the power before replacement.

Upper transport unit Operator panel

Lever

Power switch

Lever (green)

Roller ASY

(1) Turn off the power switch. Make sure that the hopper table is at the bottom.
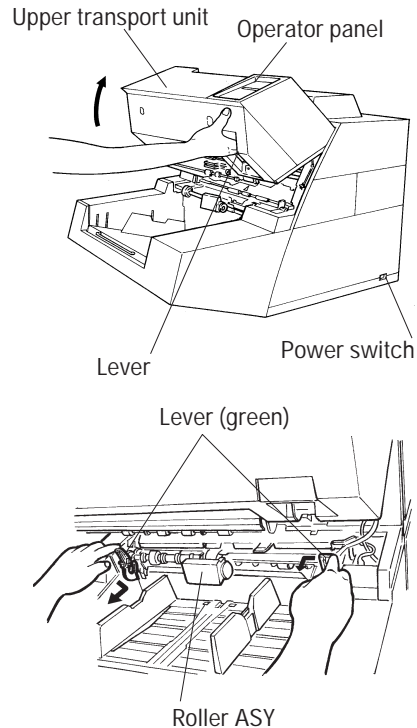
(2) Open the upper transport unit. (See page B-2)

(3) Disconnect the two relay connectors on the roller ASY.

(4) Push the two levers (green) towards each other to disengage with the upper locking holes and lower down the two levers until they engage with the two levers locking holes.

Guide plate

Hopper table

Guide

Pad

A

Bracket
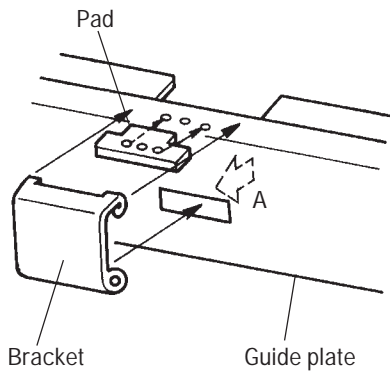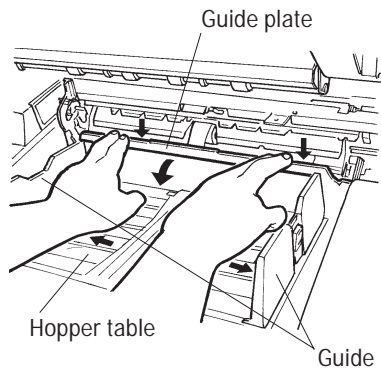
Guide plate

5. Lift the document sensor unit and keep it at the upper position with one hand and pull the roller ASY out with the other hand.

6. Move the guide on the hopper table completely to the end.

7. Hold both ends of the guide plate and press them down to remove the guide.

8. Press the bracket in the direction A, and detach the bracket and pad.

Note:
When assembling the pad, align the holes on the pad with the projection of the guide plate.

ERROR PROCESSING AND RECOVERY

This chapter provides how to handles temporary errors and equipment errors and what the operator should do to recover the scanner.

Device and Operator Actions for Temporary Errors

Table 5.1 lists the scanner and operator actions for temporary errors.

Table 5.1 Device and operator actions for temporary errors

LCD display (*1)	Scanner actions (*2)	Action to recover (*3)
PAPER JAM	- The normally read document is ejected to the stacker and the mechanism system is stopped to suspend the read operation. - "Temporary Error" is returned to the host computer and an error message is displayed on the LCD display. - The hopper table is lowered to the bottom.	- Open the upper transport unit and remove the document on the transport path. Then, close the unit. - Return the jammed or double-fed document to the hopper and read it again.

*1: More detailed error messages are shown by the method specified in maintenance manual.
*2: Common action at temporary errors is 0.5 second interval buzzer for 3 seconds.
*3: The temporary errors are recovered by pressing the stop button.

Table 5.1 Device and operator actions for temporary errors (continued)

LCD display	Scanner actions	Action to recover
HOPPER EMPTY	[When a read operation is activated, the pick sensor (SPK) goes off but not the hopper empty sensor (SHE) is off.] - If an error is detected, the hopper table is lowered. Then, "Temporary Error" is returned to the host computer and an error message is displayed on the LCD display. [The hopper empty sensor (SHE) goes on during reading.] - The read operation is terminated normally. After the document is ejected into the stacker, the hopper table is lowered. When a START, READ, or SENSE command is received from the host computer, "Temporary Error" is returned. *: This status is not detected in the manual mode.	- The error is recovered by issuing the start command. - Load documents on the hopper and start reading them.

Table 5.1 Device and operator actions for temporary errors (continued)

LCD display	Scanner actions	Action to recover
COVER OPEN	- The mechanism system is stopped immediately and an error message is displayed on the LCD display. - If the scanner is not working, "Temporary Error" is returned when a SENSE, START, or READ command is received. - The hopper table is lowered to the bottom.	- Close the upper transport unit or the endorser cover. - Or turn the thumb screw to lock the back-side lamp unit.
MISS PICK	- When an error is detected, the magnetic clutch (pick clutch) is turned off and the normally scan document is ejected to the stacker. Then, the mechanism system is stopped. - "Temporary Error" is returned to the host computer and an error message is displayed on the LCD display. - The hopper table is lowered to the bottom.	- Open the upper transport unit and remove the document on the transport path. Then, close the unit. - Return the jammed document on the hopper and read it again.
ROLLER UNIT NOT SET	- The ADF roller ASY is not mounted correctly.	- Open the upper transport unit and correct the roller unit setting, then close the upper transport unit. See chapter 4, "Roller ASY Replacement".
HOPPER OVER-LOAD	- The documents loaded on the ADF exceed the specified number of pages.	- Remove the document to the specified number of sheets.

ERROR PROCESSING AND RECOVERY

Table 5.1 Device and operator actions for temporary errors (continued)

LCD display	Scanner actions	Action to recover
PRINT HEAD NOT SET	- Print head is not set. - "Temporary Error" is returned to the host computer and an error message is displayed on the LCD display.	- Press "STOP" to reset the error and set the print head again.
PRINT HEAD ALARM	- Print head is not set correctly or does not work well. - "Temporary Error" is returned to the host computer and an error message is displayed on the LCD display.	- Press "STOP" to reset the error and set the print head again. - If the error message is displayed on the LCD display again, change the print head.

Device and Operator Actions for Equipment Errors

Table 5.2 lists the scanner and operator actions for equipment errors.

Table 5.2 Device and operator actions for equipment errors

LCD display	Scanner actions	Action to recover
HOPPER ALARM	- The Check lamp lights and an error message is displayed on the LCD display. - The mechanism system is stopped.	- Check if the lamp or heater is attached correctly. Replace lamp according to the replacement method. - If turning the power on again does not recover the scanner, contact the maintenance personal.
TRANS-PORT ALARM	- The Check lamp lights and an error message is displayed on the LCD display. - The mechanism system is stopped.	

Table 5.2 Device and operator actions for equipment errors (Continued)

LCD display		Scanner actions (*1)	Action to recover
LAMP ALARM 1		- The Check lamp lights and an error message is displayed on the LCD display. - The normally scan document is ejected to the stacker and the mechanism system is stopped.	- Check if the lamp or heater is attached correctly. Replace lamp according to the replacement method. - If turning the power on again does not recover the scanner, contact the maintenance staff.
LAMP ALARM 2			
HEATER ALARM 1			
HEATER ALARM 2			
CCD UNIT ALARM 1			
CCD UNIT ALARM 2			
TEMP. ALARM			- If turning the power on again does not recover the scanner, contact the maintenance personal.
FUSE ALARM * PRINT			
RAM ALARM * PRINT			
TIME-OUT * ALARM PRINT			
HARDWARE ALARM	EEPROM ALARM	- The Check lamp lights and an error message is displayed on the LCD display. - The FAIL signal on.	
	RAM 6 to 9 ALARM		
	V-RAM 1 to 4 ALARM		
PROGRAM ERROR			Check if the terminator is installed.

* Endorser option only

*1: Common action at equipment error is the buzzer activated for 3 seconds.

DOCUMENT SPECIFICATION

This chapter provides document specification (size, type, limitations, grounding color area, drop-out color, and job separation sheet) for the scanner.

Document Size

Figure 6.1 shows document sizes which the scanner can read. For M3099GH, however, maximum size of A3 can be fed through the scanner.

A

Feeding direction

B
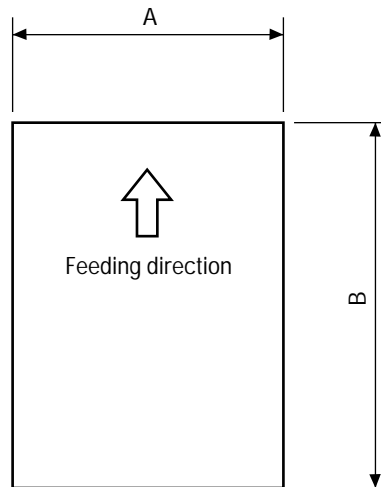
(Unit: mm)

Scanner	Maximum		Minimum	
	A	B	A	B
M3099GH	216	356	76	63
M3099GX	297	432	76	63

Figure 6.1   Document size

Document Quality

This section provides document types and weights available for the scanner, with precautions.

Document type

The recommended paper type for document is as follows:

NOTICE

Use specified paper only. (In rare occasion, double feeding may occur or document damage may occur.)

• Fine paper
• Plain paper (For example the paper specified for XEROX 4024)
• OCR paper

When using all other type paper, check that it is successfully fed by ADF before performing a reading operation.

Ream weight

The ream weight is as follows:
• 45 to 110 kg (13.9 to 34 lb, 52 to 127 g/m^2)

Note:
Ream weight is a weight of 1000 sheets of paper whose size is 788 mm x 1091 mm.

Precautions

Be careful to scan the following documents. Preliminary document feed test may be necessary to avoid the unexpected errors. If the document slips in ADF (JAM error) or double feed occurs, separation pressure adjustment of Appendix C may be effective.

CAUTION

Never use an original document on this machine.

• Paper has clip
• Paper has ink, etc. is not dry.

- Paper thickness is not constant. (like envelope)
- Paper has large rumples or curl. (See Note in next page)
- Paper has folds or tears.
- Tracing paper
- Coating paper
- Carbon paper
- Carbonless paper
- Paper size; smaller than 76 mm x 63 mm size, or larger than A3 width.
- Other than paper; clothes, metal foil, or OHP film.
- Photographic paper
- Paper has notches on its side.
- Shape is other than square.

NOTICE

Do not feed important original document so as not damage it in rare case.

When scanning a translucent document, set the density to light mode.

To prevent roller smudging, avoid scanning a document filled out in pencil. Clean the roller as often as possible when scanning many document. Once every 1000 pages is recommended.

The chemical composition of some carbonless papers reacts with the roller rubber and damages the rubber. Check the carbonless papers before use.

The carbonless papers may be used if:
1. Ream weight is 44 kg (12 lb) or more
2. Hopper load is 500 sheets or fewer

Note:
• If carbonless papers are used, clean the roller twice as often as usual.
• Paper should be straightend to fit the condition below.
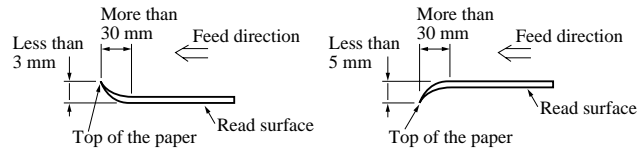
Document Limitations

This section provides restrictions on document used for the scanner.

Areas that must not be perforated

Perforations are prohibited in the shaded area of Figure 6.2 to avoid document size detection error or job separation sheet detection error or jam.
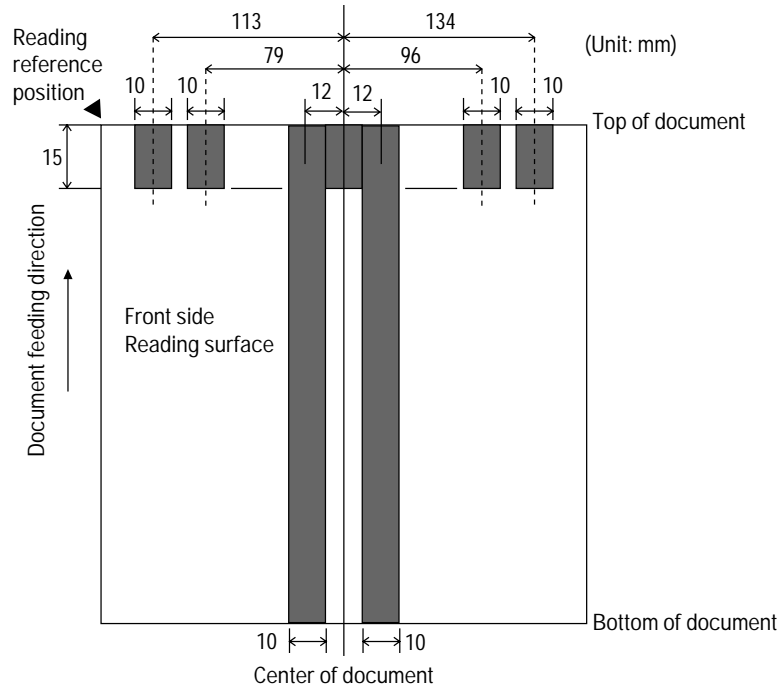
Figure 6.2 Areas that must not be perforated

Print prohibit areas on the front and back surfaces

Printing in area A on the front of a document may, in rare case, cause a document size detection error. Printing in area B on the front and back of a document may, in rare case, result a double feed error. Figure 6.3 shows print prohibit areas on the front and back surfaces.

Note: Figure 6.3 shows the document as viewed from the reading surface.
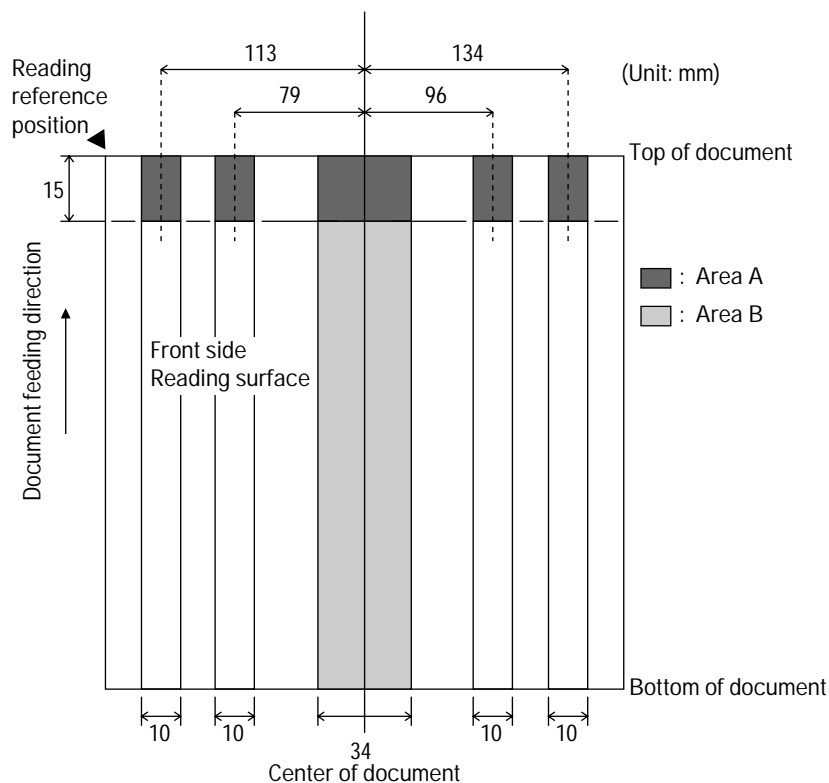
Figure 6.3 Print prohibit areas on the front and back surfaces

Grounding Color Area

As Figure 6.4 shows, the top 3-mm part of the read area on each surface should be left blank (grounding color) by specifying a drop-out color. If the drop-out color cannot be specified, select "Photo" for the document type (line drawing or photograph).

For details of the drop-out color, see next Section.
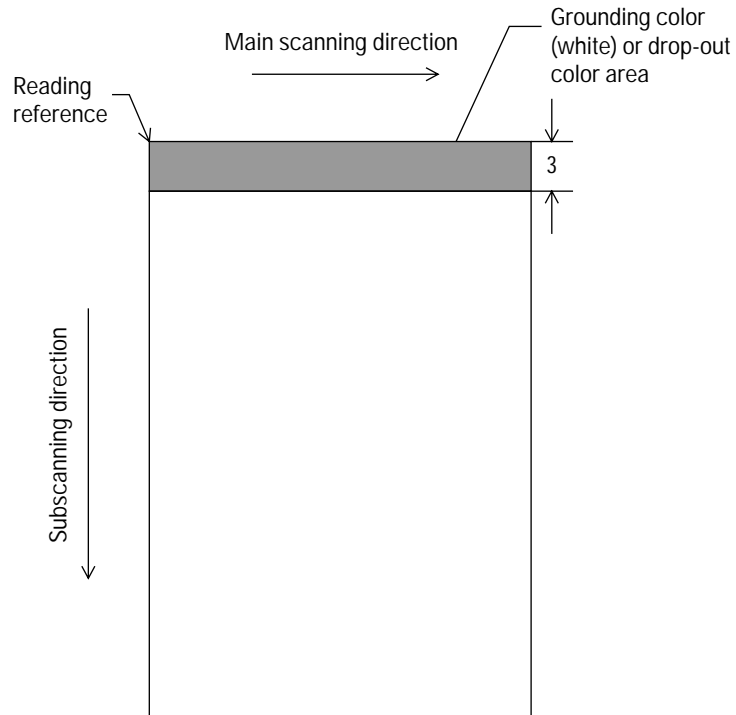
Figure 6.4 Grounding color area

Drop-out Color   A drop-out color is color visible by a human eye but not visible to the scanner.

To check the grounding color of document for a drop-out color, use the method and follow the standards given below.

Print density measurement

The spectrum chart shows in Figure 6.5 is used to measure print density.

The measurement must be made in one of the following ways:
• A light source using fluorescent G54
• Macbeth PCS meter PCM II is used, which requires a filter.
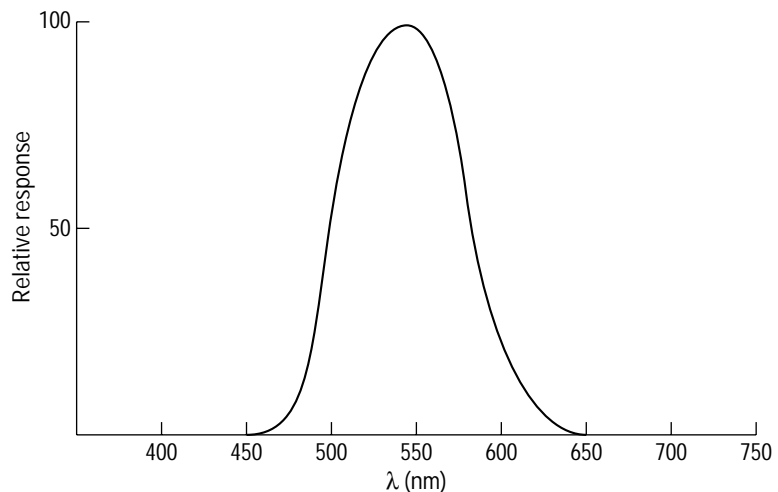
Figure 6.5   Spectrum band

Drop-out color standards

In the spectrum of fluorescent lamp G54, the PCS value must satisfy the following standards:
• Maximum: 0.14 or less
• Average: 0.1 or less

Job Separation Sheet

Shape

The following Figure 6.6 shows the basic of the document.
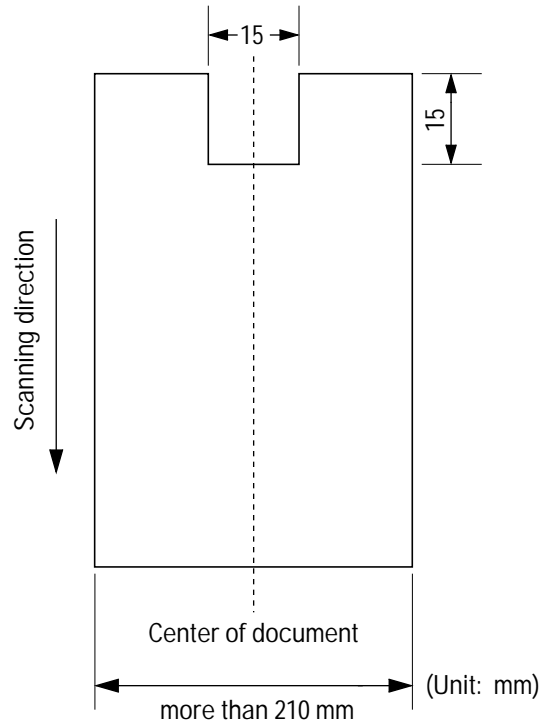
Figure 6.6 Shape of document

Document type

The document type and ream weight specifications given in page 6-2.

However, the document size shall be A4 or larger (210 mm or more wider).

CONSUMABLES AND ACCESSORIES

This chapter provides consumables and accessories of the scanner.

Consumables

Table 7.1 lists consumables used for the scanner. Be sure to keep some spare parts in stock.
The abrasion counter can be used to check the number of scanned documents. (See page 4-6)

Table 7.1 Consumables

Name	Specification	Remark
Lamp	CA02950-0548	Up to 500 hours or more. Two lamps per scanner
Pick roller	CA01023-F242	Up to 300,000 sheets or one year. Requires two per scanner.
Roller ASY	CA02869-F230	Up to 600,000 sheets or one year. This part contains Pick Roller but the life of the Roller Units does not include the life of the Pick Roller.
Belt	CA02869-Y218	Up to 300,000 sheets or one year.
Belt ASY	CA02869-F220	Up to 600,000 sheets or one year. This part includes Separation Belt but the life of the Belt Assembly does not include the life of the Separation Belt.
Pad	CA01023-G290	Up to 300,000 sheets or more.
Print head	CA01023-0701	Black ink for endorser option. Ten print heads are packed. Each print head has the life of 20,000 sheets at 10 characters per sheet.

Accessories   Table 7.2 lists accessories of the scanner.

Table 7.2 Accessories

Name	Quantity	Remark
Power cable (100 V or 200 V)	1	
Operator's guide	1	
Terminator	1	
Consumable kit	1	

CHAPTER

8

CLEANING

This chapter provides cleaning locations and frequencies, cleaning tools, and procedure.

Cleaning Locations and Frequencies

Table 8.1 lists cleaning locations and frequencies of the scanner.

Table 8.1 Cleaning locations and frequencies

Locations		Tools	Frequencies
Front-side lamp		Dry cloth	Every 50,000 sheets
Roller and belt		Cleaning sheet	Every 50,000 sheets
		Cleaner F2	
		Dry cloth and isopropyl alcohol	Every 200,000 sheets
Transport path		Dry cloth and isopropyl alcohol	
Glass surface			
Sensor tops	Document width-detection		
	Document detection		
	Front-side reading timing detection		
	Ejection detection		

Note: Depending on use, it may be necessary to clean more frequently.

Cleaning Tools   The tools required for cleaning are as follows:
- Cleaning cloth (dry cloth, lint free)
- Cleaner F2
- Isopropyl alcohol (Cleaner F1)
- Cleaning sheet
- Q-Tips

NOTICE: Cleaner F2 should be used for steel rollers.

Procedure   This section provides instructions on how to clean each section of the scanner.

WARNING
Wait at least 3 minutes after turning off the power before cleaning.

Cleaning the front-side lamp
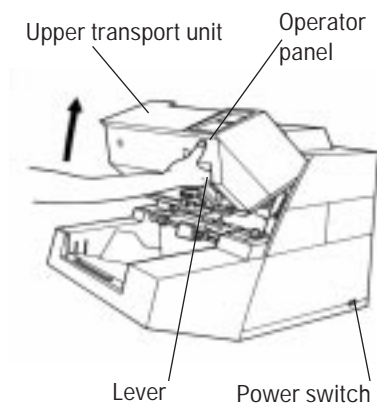
Upper transport unit   Operator
                           panel

Lever   Power switch

1   Turn off the power switch.

2   Open the upper transport unit. (See page 4-2)

Lamp socket covers

3   Remove the two lamp socket covers (U-shaped spring clips) by pulling them out of their positions.

Upper transport unit

Lamp
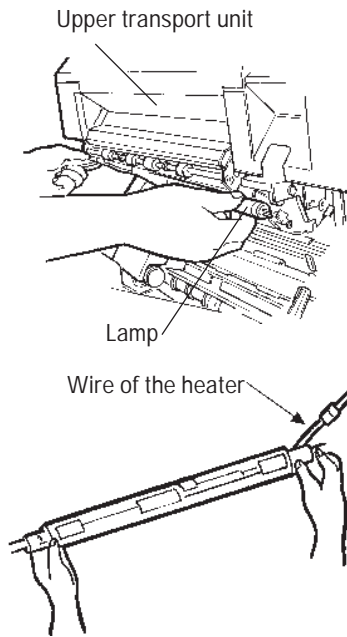
Wire of the heater

4 Rotate the lamp so that the two terminals on each and align with the exit slot on the lamp socket.
Maintain the alignment and remove the lamp from the lamp sockets.

CAUTION

Be careful not to pull the wire of the heater hard.

5 Clean the lamp with a dry cloth.

CAUTION

• **Be careful not to peel the tape on the heater.**

• **If any visible damage on the heater is observed, please contact manufacturer's authorized service center for proper repair service.**

Window: transparent part

Window

b₁

b₂
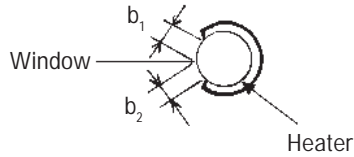
Heater

Cross-sectional view of lamp
and heater

Note:

Make sure that the following
lengths are the same:
a1 = a2
b1 = b2

Socket

Front

Rear

Window
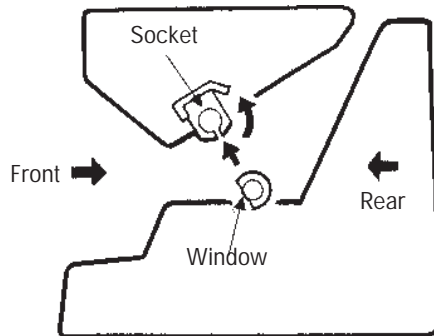
6   To re-install lamp/heater,
     reverse procedures in item
     4   above.

Note:

When re-installing the lamp,
make sure to rotate the lamp in
the direction as shown in the
left figure.

7   Close the upper transport
     unit. (See page 3-5)

Cleaning the rollers

Cleaning the rollers with Cleaning Sheet:

Guide

Hopper table

"B4"

Lock lever

Hopper table

Right guide

Left guide

FRONT
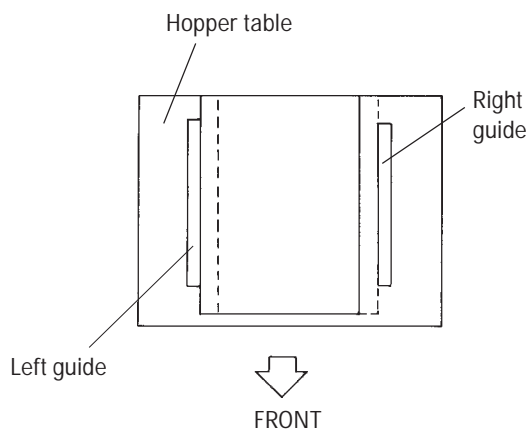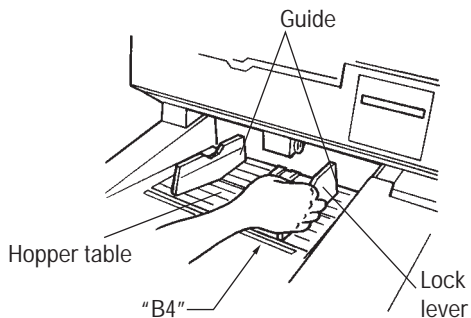
① Set the hopper table guides to the B4 width.

② Remove protective paper from the cleaning sheet. With the adhesive side up, place the cleaning sheet on the hopper table by aligning it with the left guide.

③ Press [MODE2] twice, [MODE1] once, then [START]. (The hopper table goes up and the cleaning sheet is transported.)

④ By aligning with the right guide, place the same cleaning sheet on the hopper table with the adhesive side up.

⑤ Transport the cleaning sheet by the switch operations of ③.

⑥ Place a new cleaning sheet on the hopper table with the adhesive side down, and repeat steps ② to ⑤.

CLEANING

Cleaning the rollers with dry cloth and alcohol (Cleaner F1)

This roller exists only 1000 sheets hopper type.

Upper transport unit

Pick rollers

Belt   Lower transport unit
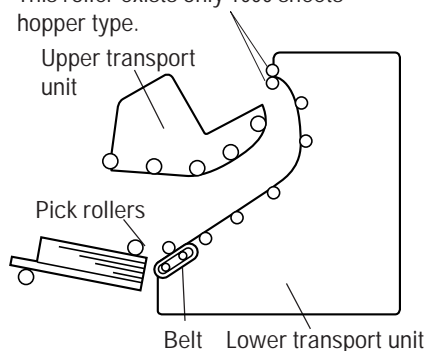
1. Open the upper transport unit. (See page 4-2)

2. Wipe the pick rollers, belt and the upper and lower transport unit rollers with a dry cloth or cloth soaked in isopropyl alcohol.

3. Close the upper transport unit. (See page 4-2)

Cleaning the steel rollers with cleaner F2

This cleaning is required when the toner stick to the roller.

Feed roller
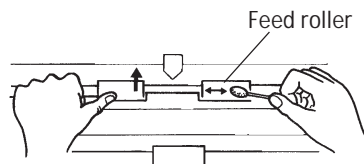
1. Open the upper transport unit. (See page 4-2)

2. Apply a small amount of cleaner F2 to a Q-Tips. While turning the roller slowly, wipe its surface with Q-Tips.

Cleaning the transport paths

Clean the transport paths as follows

This roller exists only 1000 sheets hopper type.
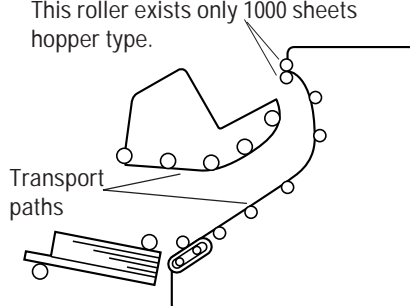
Transport paths

1. Open the upper transport unit. (See page 4-2)

2. Wipe the transport paths with a dry cloth or cloth soaked in isopropyl alcohol. Use a vacuum cleaner when removing paper dust from the paths.

3. Close the upper transport unit. (See page 4-2)

Cleaning the glass surface

Clean the glass surface of the sheet guide assembly as follows:

Glass

Sheet guide assembly
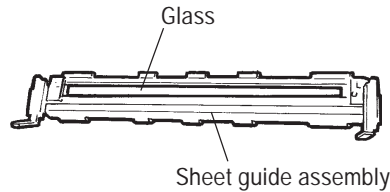
①　Open the upper transport unit. (See page 4-2)

②　Lift the sheet guide assembly by holding the handles on both ends and pull it out of the machine.

③　Wipe the glass surface (on both sides) with a dry cloth or cloth soaked in isopropyl alcohol.

④　Re-install the sheet guide assembly.

⑤　Close the upper transport unit. (See page 4-2)

Cleaning the sensors

Document width detection sensor

Clean the four document width detection sensors as follows:
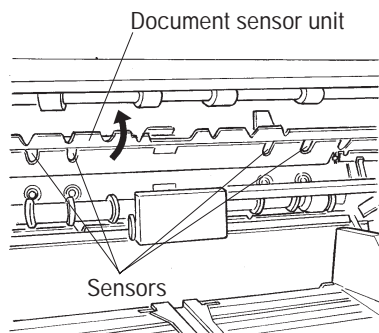
Document sensor unit

Sensors

①　Open the upper transport unit. (See page 4-2)

②　Hold the handles of the document sensor unit and keep the unit open.

③　Wipe the top of the four sensors with a dray cloth or cloth soaked in isopropyl alcohol.

④ Close the document sensor unit.

⑤ Close the upper transport unit. (See page 4-2)

Document detection sensor

Clean the document detection sensor as follows:
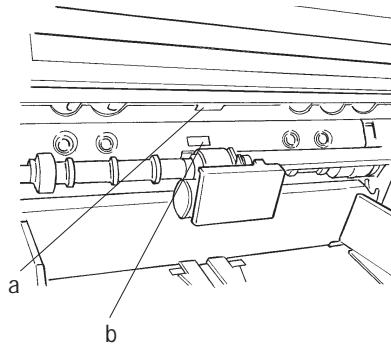
① Open the upper transport unit. (See page 4-2)

② Hold the handles of the document sensor unit and keep the unit open.

③ Wipe the two sensor windows (a and b) with a dry cloth or cloth soaked in isopropyl alcohol.

④ Close the document sensor unit.

⑤ Close the upper transport unit. (See page 4-2)

a

b

Reading timing sensor

Clean the reading timing sensor as follows:
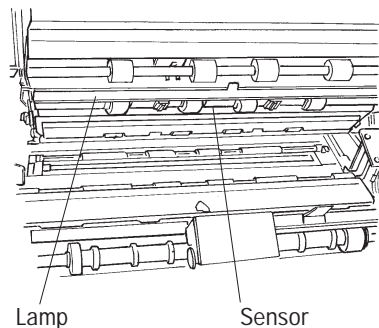
①　Open the upper transport unit. (See page 4-2)

②　Wipe the sensor top of sensor at the transport path of the upper transport unit with a dry cloth or cloth soaked in isopropyl alcohol.

③　Close the upper transport unit. (See page 4-2)

Lamp　　　　　　Sensor

Ejection sensor

Clean the ejection sensor as follows:
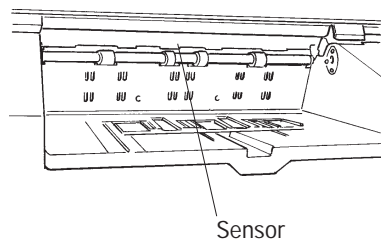
①　Open the upper transport unit. (See page 4-2)

②　Wipe the top of sensor at the rear center of the device with a dry cloth or cloth soaked in isopropyl alcohol.

③　Close the upper transport unit. (See page 4-2)

Sensor

ENDORSER

A1. Specifications Table A.1 lists the endorser specifications.

Table A.1 Endorser specifications

Item	Specification
Printing method	Ink jet printing method
Characters	Alphabet: A to Z, a to z Number : 0, 1, to , 9 Symbol : ! " # $ % & ' ( ) * + , – . / : ; < = > ? @ [¥] ^ _ ¯ {	} (blank)
Maximum number of characters	20
Character size	2.9×1.5 mm $(0.11'' \times 0.06'')$ (hight $\times$ width)
Character pitch	Approx. 2.54 mm (0.1″)
Print area	Back-side of the document A > 5 mm (0.2″) B > 28 mm (1.1″) C > 20 mm (0.79″) D > 5 mm (0.2″)
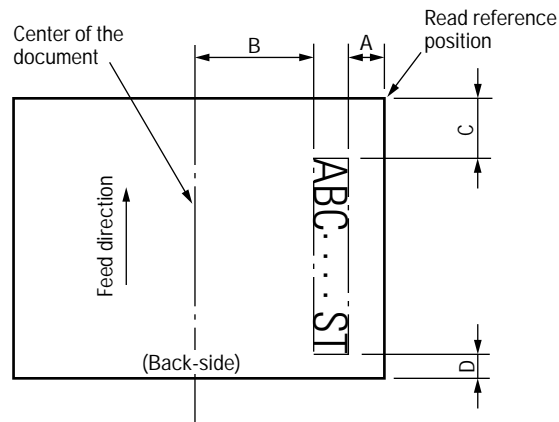
Figure A.1 Print area

A2. Panel operation

By the operator panel you can set following conditions. Other conditions such as print offset, print characters can be set by the host machine.

A2.1 How to set the endorser ON (or OFF)

When you use the endorser, you must set the endorser ON as follows.

```
<< SETUP MODE >>
-----------------------------------
```
Screen 1

① While pressing the [Mode 1], turn on the power of the scanner. Then the LCD displays the SETUP MODE initial screen. (Screen 1)

```
<< SETUP MODE >>
-----------------------------------
ENDORSER  INITIAL
```
Screen 2

② Press [Mode 1] eight times to go to the ENDORSER INITIAL screen. (Screen 2) Then press [Mode 2]. If "ON" is displayed, the endorser is already on. (Screen 3)

```
ENDORSER       VALUE
-----------------------------------
*  ON             0 0 0 0 1
```
Screen 3

③ If "OFF" is displayed, press [Mode 1], until "OFF" blinks. Then press [Mode 2] to turn the endorser ON. (Screen 3)

If you want to set the status in EEPROM, go to ⑤. Then if you want to close the job, go to ⑥ and ⑦.

NOTICE: **Set the endorser ON only when you use endorser, or the characters may be printed on every scanned document.**

A2.2 How to set the initial number

Initial number is the number which the scanner starts printing or returns after the reset of print number.

```
ENDORSER       VALUE
-----------------------------------
*  ON             0 0 0 0 5
```
Screen 4

④ At Screen 3, press the [Mode 1] until the digit you want to changes blinks. Then press [Mode 2] until the digit changes as you want. (Screen 4: In this case the initial number is five.)
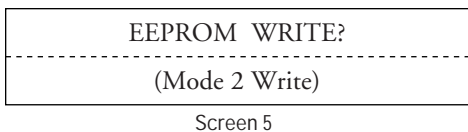
```
┌─────────────────────────────┐
│     EEPROM  WRITE?          │
│- - - - - - - - - - - - - - -│
│     (Mode 2 Write)          │
└─────────────────────────────┘
          Screen 5
```

⑤To set the status in EEPROM, press [Mode 1] until * blinks. Then press [Mode 2] to change the LCD display into Screen 5. If you want to set, press [Mode 2]. And the LCD displays Screen 6 about three seconds.

```
┌─────────────────────────────┐
│- - - - - - - - - - - - - - -│
│     EEPROM Writing!!        │
└─────────────────────────────┘
          Screen 6
```

⑥If you want to return to the ENDORSER INITIAL screen (Screen 2), press [Mode 1] and [Mode 2] at a time.

⑦If you want to return to the initial status to read, press [STOP].

A2.3 How to set the print number reset condition

You can choose whether to reset or not when HOPPER EMPTY is detected.

```
┌─────────────────────────────┐
│      << SETUP MODE >>       │
│- - - - - - - - - - - - - - -│
│   ENDORSER  RESET METHOD    │
└─────────────────────────────┘
          Screen 7
```

⑧At Screen 1 press [Mode 1] nine times to go to the ENDORSER RESET METHOD screen. (Screen 7)

⑨Press [Mode 2] to see Screen 8. If "ON" is displayed, the print number will be reset when HOPPER EMPTY is detected. If "OFF" is displayed, it wouldn't. The "ON" or "OFF" status flips each time you press [Mode 1]. The status will be set in EEPROM automatically.

```
┌─────────────────────────────┐
│    HOP-EMPTY RESET          │
│- - - - - - - - - - - - - - -│
│         ON                  │
└─────────────────────────────┘
          Screen 8
```

ENDORSER

⑩If you want to return to Screen 7 , press [Mode 2].

If you want to close the job, go to⑦.

A2.4 How to reset the print number manually

You can reset the print number to the initial number by operator panel as follows.

```
┌─────────────────────────────┐
│      << SETUP MODE >>       │
│- - - - - - - - - - - - - - -│
│     ENDORSER  RESET         │
└─────────────────────────────┘
          Screen 9
```

⑪At Screen 1 press [Mode 1] ten times to go to the ENDORSER RESET screen. (Screen 9)

```
┌─────────────────────────────────┐
│ RESET          VALUE   0 0 0 0 1 │
│---------------------------------│
│ No-Mode 1          Yes-Mode 2   │
└─────────────────────────────────┘
```
Screen 10

```
┌─────────────────────────────────┐
│ RESET Finish !!        0 0 0 0 1 │
│---------------------------------│
│                                 │
└─────────────────────────────────┘
```
Screen 11

⑫ Press [Mode 2] to see Screen 10. You may see current print number. If you want to reset the number, press [Mode 2]. And you can see Screen 11 for 3 sec. If you don't want it, press [Mode 1] to go to Screen 9.

If you want to close the job, go to 7.

A2.5 How to reset the print head life counter

You must reset the print head life counter, when you replace the print head.

```
┌─────────────────────────────────┐
│        << SETUP MODE >>         │
│---------------------------------│
│           INK RESET             │
└─────────────────────────────────┘
```
Screen 12

```
┌─────────────────────────────────┐
│           INK RESET             │
│---------------------------------│
│ No-Mode 1          Yes-Mode 2   │
└─────────────────────────────────┘
```
Screen 13

```
┌─────────────────────────────────┐
│ RESET Finish !!                 │
│---------------------------------│
│                                 │
└─────────────────────────────────┘
```
Screen 14

⑬ At Screen 1 press [Mode 1] eleven times to go to INK RESET screen. (Screen 12)

⑭ Press [Mode 2] to see Screen 13.
If you want to reset the counter, press [Mode 2]. And you can see Screen 14 for 3 sec.
If you don't want it, press [Mode 1] to go to Screen 12.

If you want to close the job, go to ⑦.

A2.6 How to test the printing by the operator panel operation

You can check the print result by the following procedures.

```
┌─────────────────────────────────┐
│         << CE MODE >>           │
│---------------------------------│
│ TEST××          : START         │
└─────────────────────────────────┘
```
Screen 15

⑮ Set the endorser ON by the procedure of the section A2.1.

⑯ While pressing the [Mode 2], turn the power of the scanner on. Then the LCD displays the MAINTENANCE MODE initial screen. (Screen 15)

⑰ Press [Mode 2] once and press [Mode 1] once. Place the document on the stacker. Then press [START].

NOTICE: **The scanner prints the five digit numbers from the initial number by the increment of one.**

NOTICE: **Before pressing [START], you can set document size, resolution and so on. (See OPERATOR'S GUIDE)**

A3. Print head handling

A3.1 Replacing the print head

When "INK EMPTY" is displayed in LCD display, the operator is responsible to change the print head as follows.
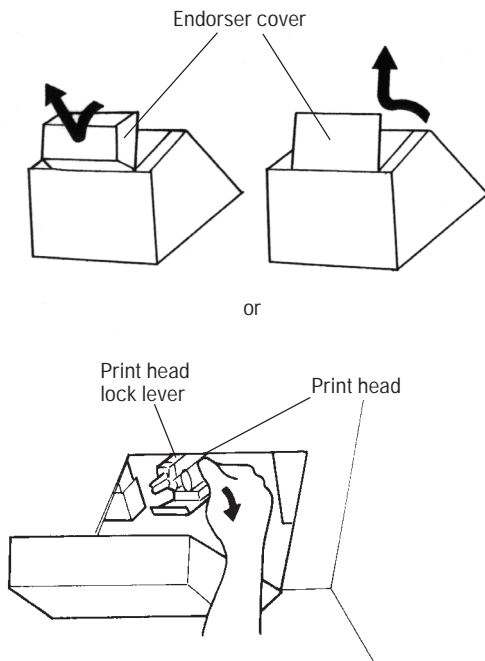
Endorser cover

or

①Open and remove the endorser cover at the rear top corner of the scanner. Power of the scanner will turn off, if the power is on at cover open.

②Turn the print head lock lever up, then replace the print head.

Print head lock lever   Print head

③Attach the new print head in the endorser and turn the print head lock lever back.

④Close the endorser cover back.

⑤ Reset the print head life counter by the procedure stated in section A2.5. (See NOTICE)

You can test the printing by the procedure in section A2.6

NOTICE: The reset of the print head life counter is important to correctly detect the life of the new print head.

A3.2 Print head position adjustment

You can adjust the print position in mainscanning direction manually. The position you can set is limited as stated in section 1.
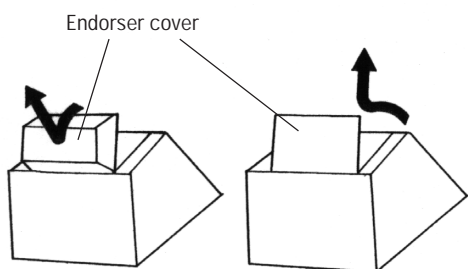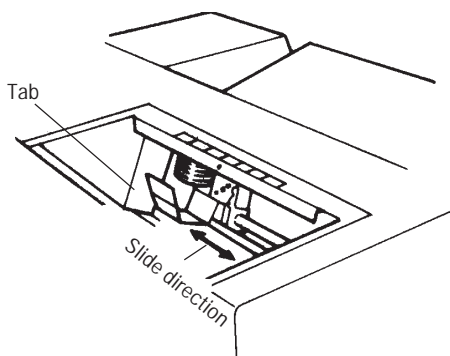
① Open and remove the endorser cover at the rear top corner of the scanner. Power of the scanner will turn off, if the power is on at the cover open.

② Pinch the tab near the print head and slide it to the position you want to print. The print position is indicated by the indicater behind the tab and the label attached on the rear cover.

③ Close the endorser cover.

You can test the printing by the procedure in section A2.6.

Endorser cover

or

Tab

Slide direction

B

SETUP MODE

This chapter explains the setup mode of the scanner.

B.1 Activating the setup mode

When you activate the setup mode, you must set as follows.

```
------------------------------------
           Warming-up Now!!
------------------------------------
```
Screen 1

① While pressing the [Mode 1], turn on the power of the scanner. Then the LCD displays Screen 1.

```
           << SETUP MODE >>
------------------------------------
```
Screen 2

② After a while the LCD displays the SETUP MODE initial screen. (Screen 2)

③ Press the [Mode 1] to go to the SETUP MODE menu screen. Press the [Stop] to go to the readable status. (Screen 3)

```
------------------------------------
           Scanner Ready
```
Screen 3
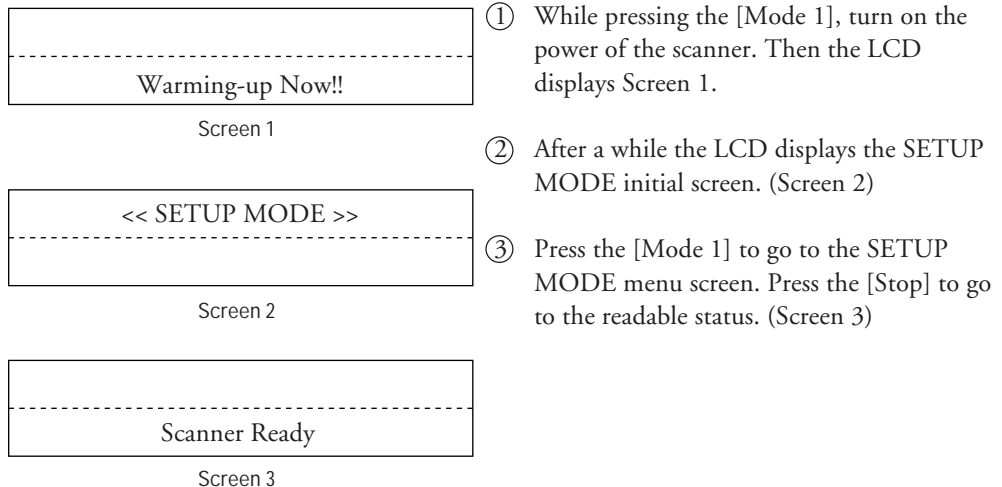
B.2 Operational transition in the setup mode

POWER ON

IRAS

1

2   Setup mode

Warm-up

WAIT

·····▶ When [Mode1] button is pressed at power-on

① Press the [Mode1] button

② The device goes online.
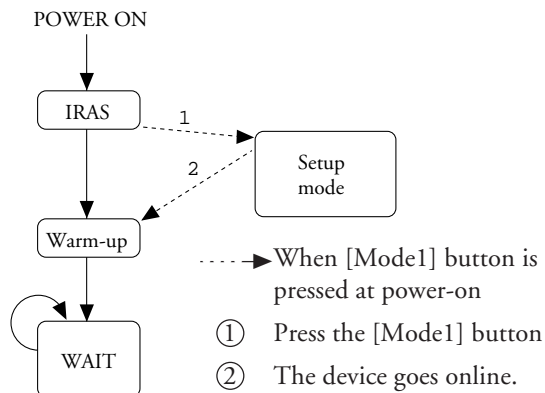
B.3 Contents of the setup mode

The setup mode can be classified into eighteen:

Mode	Setup type	Contents
1	Setting double feed detection	Set in EEPROM whether double feed detection is done or not.
2	Setting IPC-2 pre-set	Set in EEPROM the pattern No. of IPC-2 pre-set mode.
3	Reset of abrasion counter	Reset the abrasion counter after Belt/Roller are exchanged.
4	Setting buzzer	Set in EEPROM whethr the buzzer function is on or off.
5	Setting pre-pick	Set in EEPROM whether pre-picking is done for fast reading or not.
6	Adjusting LCD contrast	Set in EEPROM the LCD contrast.
7	Setting pick speed	Set in EEPROM whether pick speed is fast or slow.
8	Setting initial value of endorser number	Set the using of endorser and the initial number. The set value is able to be stored in EEPROM.
9	Setting method of endorser reset	Set in EEPROM whether the number is reset by hopper empty detection.
10	Reset of endorser number	Reset the number to initial value.
11	Reset of ink counter	Reset the ink counter after the print head has be replaced.
12	Setting SCSI-ID	Set the SCSI-ID (0–7).
13	Setting Product-ID	Set the Product-ID. (M3096G/M3099G/M3099GH)
14	Setting picking start time	Set in EEPROM the time from when the hopper empty sensor is blocked in manual mode until picking begins.
15	Setting picking time	Set the time from when picking begins until the SF1 sensor is blocked by paper.
16	Setting time-out limit	Set the time from when a command is issued in manual mode until paper is actually detected.

Mode	Setup type	Contents
17	Setting hopper time	Set the time from when Start Command Timeout limits until hopper table is lowered.
18	Setting heater control	Set in EEPROM whether the heater control is on or off.

B3.1 Setting double-feed detection

When you set the using of double-feed detection, you must set as follows.

```
<< SETUP MODE >>
---------------------------------
DOUBLE FEED CHECK
```
Screen 4

```
DOUBLE FEED CHECK
---------------------------------
OFF            1           15mm
```
Screen 5

```
DOUBLE FEED CHECK
---------------------------------
OFF            1           15mm
```
Screen 6

```
DOUBLE FEED CHECK
---------------------------------
OFF            1           15mm
```
Screen 7

④ At Screen 2, press [Mode 1] once to go to the DOUBLE FEED CHECK screen. (Screen 4)

⑤ Press [Mode 2] to see Screen 5. If "ON" is displayed, the error will be detected when the double-feed is occured. If "OFF" is displayed, it wouldn't. The "ON" or "OFF" status flips each time you press [Mode 2].

⑥ Press [Mode 1] to see Screen 6. This means how to defect the double-feed as follows.
"1" is the method by comparing with the length of the first paper.
"2" is the method by the output of Document detection sensor in addition to "1".
At Screen 6, press the [Mode 2] until the number changes as you want.

⑦ Press [Mode 1] to see Screen 7. This means the length to compare with the paper based on. If you choose "1" or "2" and set "15mm", the double-feed is detected when the scanned paper length is 15mm longer than the first paper.
At Screen 7, press the [Mode 2] until the number changes as you want.
(You can choose 10, 15 or 20mm. The default is 15mm.)

SETUP MODE

⑧ Press [Mode 1] and [Mode 2] at a time to see Screen 4. The settings are stored to EEPROM.

⑨ When you close the setup mode, press [Stop]. Then the readable screen is displayed.

Mode	Details
ON/OFF	"OFF" is default setting.
1	"1" is default setting. This mode is used when the batch of paper which length are same are scanned. When the paper which tears and wrincled are scanned, Scanner may mistake it also.
2	This mode is used when the batch of paper which length and thickness are same are scanned. However, when the thin papers are scanned, Scanner may mistake to detect the Double-feed rarely. In case of this, please test to scan the thin papers in advance.

B3.2 Setting IPC-2 pre-set mode

When you set the using of IPC-2 pre-set mode, you must set as follows.

```
<< SETUP MODE >>
----------------------
     IPC-2 SET
```
Screen 8

```
     IPC-2 SET
----------------------
        No
```
Screen 9
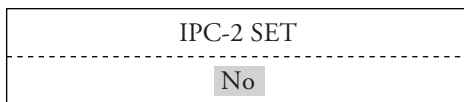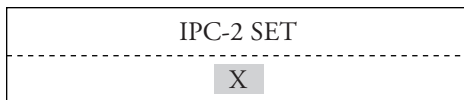
```
     IPC-2 SET
----------------------
        X
```
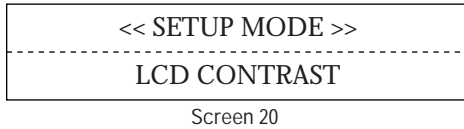Screen 10

⑩ At Screen 2, press [Mode 1] twice to go to the IPC-2 SET screen. (Screen 8)

⑪ Press [Mode 2] to see Screen 9 or 10. If "No" is displayed, IPC-2 pre-set mode is not used. If pattern number ("1"-"5") is displayed, IPC-2 pre-set mode is used. "No" or number status flips each time you press [Mode 1]. (The default setting is "No".)

⑫ If you press the [Mode 2] at Screen 9, you return to Screen 8. The setting is stored to EEPROM. If you press the [Mode 2] at Screen 10, you go to Screen 12.

		Panel/Host Set Ignore	
No-Model			Yes-Mode 2

Screen 11

		Host Set Ignore	
No-Model			Yes-Mode 2

Screen 12

⑬ If you press the [Mode 1] at Screen 12, IPC-2 pre-set mode can be not used. Also the setting is changed to "No" obligatory and stored to EEPROM. If you press the [Mode 2] at Screen 12, IPC-2 pre-set mode can be used and the setting number is stored to EEPROM.
When you close the setup mode, go to ⑨.

<Classification of user's paper>

User's paper are classified in line-art scanning as follows:
The horizontal axis shows the background density/color of paper.
The vertical axis shows the density of character/line.

		Background density		Background color		
		Normal← →Dark		Red	Green	Blue
Character density	Normal ↑ ↓ Light	① ②	③	④	⑤	

①–⑤ are the pattern number set in setup mode.

①: Normal background and character.
②: Normal background and light character.
③: Dark background and normal-density character.
④: Light character on red paper.
⑤: Light character on green paper.

<Notice>

(1) For patterns "1" to "5" when the power is turned on
Check that IPC-2 for front/back sides are installed during initialization. If IPC-2 for either the front or back side is not installed, the scanner regards as no setting obligatory and changes the memory of EEPROM.

(2) When IPC-2 pre-set is executed in setup mode
Check that IPC-2 for front/back sides are installed when the scanner enters in IPC-2 pre-set. If IPC-2 for either the front or back side is not installed, the scanner does not enter in IPC-2 pre-set.

(3) When IPC-2 pre-set mode is executed
When IPC-2 pre-set mode is executed in online mode, the reading parameter is valid or invalid (Host setting is invalid) as follows:

	Reading parameter							
	Reading mode	Transfer mode	Transfer rate	Resolution	Start of reading	Density	Line-art /Photo	Halftone
Valid	○	○	○	○	○			
Invalid						○	○	○

	Reading parameter							
	DTC	Size	Portrait /Landscape	Picking	Document selection	γ patterns	Contrast	Automatic separation
Valid		○	○	○	○			
Invalid	○					○	○	○

	Reading parameter					
	Conversion	Sharpness	Outline extraction	Overlay	Simplified DTC	Zooming
Valid	○					○
Invalid		○	○	○	○	

B3.3 Reset of abrasion counter

When you reset the abrasion counter, you must set as follows.

```
<< SETUP MODE >>
------------------------------
PAPER COUNT RESET
```
Screen 13

```
RESET       COUNT      123456
------------------------------
No-Model     Yes-Mode 2
```
Screen 14

```
RESET Finish!!          000000



```
Screen 15

⑭ At Screen 2, press [Mode 1] three times to go to the PAPER COUNT RESET screen. (Screen 13)

⑮ Press [Mode 2] to see Screen 14. You may see current paper count. If you want to reset the count, press [Mode 2]. And you can see Screen 15 for 3 seconds.
If you don't want it, press [Mode 1] to go to Screen 13.

⑯ When you close the setup mode, go to ⑨.

B3.4 Setting buzzer

When you set the using of buzzer, you must set as follows.

```
<< SETUP MODE >>
- - - - - - - - - - - - - - - - - - - -
    BUZZER SET
```
Screen 16
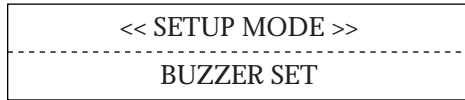
```
    BUZZER SET
- - - - - - - - - - - - - - - - - - - -
        ON
```
Screen 17

⑰ At Screen 2, press [Mode 1] four times to go to the BUZZER SET screen. (Screen 16)

⑱ Press [Mode 2] to see Screen 17. If "ON" is displayed, the buzzer will ring when the error is occured. If "OFF" is displayed, it wouldn't. The "ON" or "OFF" status flips each time you press [Mode 1]. The status will be set in EEPROM automatically.

⑲ If you want to return to Screen 16, press [Mode 2]. When yo close the setup mode, go to ⑨.

B3.5 Setting pre-pick

When you set the using pre-pick, you must set as follows.

```
<< SETUP MODE >>
- - - - - - - - - - - - - - - - - - - -
    PREPICK SET
```
Screen 18

```
    PREPICK SET
- - - - - - - - - - - - - - - - - - - -
        ON
```
Screen 19

⑳ At Screen 2, press [Mode 1] five times to go to the PREPICK SET screen. (Screen 18)

㉑ Press [Mode 2] to see Screen 19. If "ON" is displayed, the pre-picking will be done when the document is fed. If "OFF" is displayed, it wouldn't. The "ON" or "OFF" status flips each time you press [Mode 1]. The status will be set in EEPROM automatically.

㉒ If you want to return to Screen 18, press [Mode 2]. When you close the setup mode, go to ⑨.

SETUP MODE

B3.6 Adjusting LCD contrast

When you adjust the LCD contrast, you must set as follows.

```
<< SETUP MODE >>
-----------------------------
LCD CONTRAST
```
Screen 20

```
LCD CONTRAST
-----------------------------
■■■■■■■■■■■□□□□□
```
Screen 21

㉓ At Screen 2, press [Mode 1] six times to go to the LCD CONTRAST screen. (Screen 20)

㉔ Press [Mode 2] to see Screen 21. The number of '■ ' is increased and the LCD contrast is getting darker.
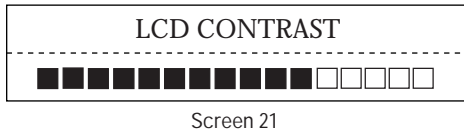
㉕ At Screen 21, the LCD contrast is set in 16 steps each time you press [Mode 1]. When all fields are filled by '■', next pressing [Mode 1] stars from all '□' (The lightest contrast).

㉖ Press [Mode 2] to see Screen 20. The settings are stored to EEPROM.

㉗ When you close the setup mode, go to ⑨.

B3.7 Setting pick speed

When you set the pick speed, you must set as follows.

```
<< SETUP MODE >>
-----------------------------
PICK SPEED SET
```
Screen 22

```
PICK SPEED SET
-----------------------------
FAST            SLOW
```
Screen 23
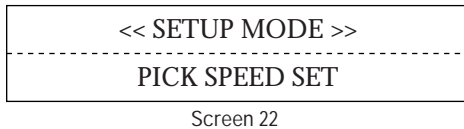
㉘ At Screen 2, press [Mode 1] seven times to go to the PICK SPEED SET screen. (Screen 22)

㉙ Press [Mode 2] to see Screen 23. (The default setting is "FAST".)
If "FAST" is displayed, the pick speed is fast.
If "SLOW" is displayed, the pick speed is slow. The "FAST" or "SLOW" status flips each time you press [Mode 1].
The status will be set in EEPROM automatically.
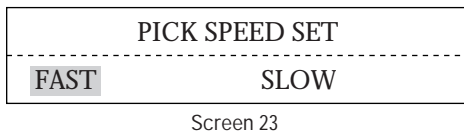
㉚ If you want to return to Screen 22, press [Mode 2]. When you close the setup mode, go to ⑨.

B3.8 Setting initial value of endorser

When you set the using of endorser and the initial number, you must see Section A2.1 and A2.2 of Appendix A. The details are as follows.

• The using of Endorser (ON/OFF)
   The default setting is "OFF" (Endorser is not used.)

• The initial number
   The default setting is "00000". The specifiable range is from 00000 to 65535.

   NOTICE: If the specified value exceeds acceptable range, returning to SETUP menu is failed.

<Method of Increment>
   In case of the initial value is "00001".

$$
\begin{array}{ll}
\rightarrow 0\ 0\ 0\ 0\ 1 & \text{(1 page)} \\
\quad 0\ 0\ 0\ 0\ 2 & \text{(2 pages)} \\
\qquad \vdots & \qquad \vdots \\
\qquad \downarrow & \qquad \downarrow \\
\quad 6\ 5\ 5\ 3\ 4 & \text{(65534 pages)} \\
\quad 6\ 5\ 5\ 3\ 5 & \text{(65545 pages)}
\end{array}
$$

   NOTICE: When it is not set "depending on operator panel" by host, no blinking. (You can not change the setting.)

   When the setting is set "ON" depending on operator panel the direction of printing is 20 mm from read reference position.

B3.9 Setting reset method of endorser

When you set the reset method of endorser, you must see Section A2.3 of Appendix A.

The default setting is "ON" (The print number will be reset when HOPPER EMPTY is detected.).

B3.10 Reset of endorser

When you reset the number to the initial number, you must see Section A2.4 of Appendix A.

B3.11 Reset of ink counter

When you reset the ink counter, you must see Section A2.5 of Appendix A.

B3.12 Setting SCSI-ID

When you set the SCSI-ID, you must set as follows.

```
<< SETUP MODE >>
- - - - - - - - - - - - - - - - - - - -
SCSI-ID SET
```
Screen 24

```
SCSI-ID SET
- - - - - - - - - - - - - - - - - - - -
5
```
Screen 25

㉛ At Screen 2, press [Mode 1] twelve times to go to the SCSI-ID SET screen. (Screen 24)

㉜ Press [Mode 2] to see Screen 25. (The default setting is "5".)

㉝ At Screen 25, the SCSI-ID is from 0 to 7 each time you press [Mode 1].

㉞ Press [Mode 2] to see Screen 24. The settings are stored to EEPROM.

㉟ When you close the setup mode, go to ⑨.

B3.13 Setting Product-ID

When you set the Product-ID, you must set as follows.

```
<< SETUP MODE >>
- - - - - - - - - - - - - - - - - - - -
PRODUCT-ID SET
```
Screen 26

```
PRODUCT-ID SET
- - - - - - - - - - - - - - - - - - - -
X X X X X X
```
Screen 27

㊱ At Screen 2, press [Mode 1] thirteen times to go to the PRODUCT-ID SET screen. (Screen 26)

㊲ Press [Mode 2] to see Screen 27. (The default setting is "M3099GH" in case of M3099GH and "M3099G" in case of M3099GX.)
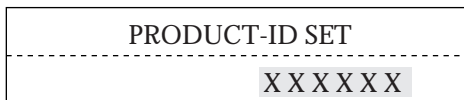
㊳At Screen 27, the Product-ID may be M3099G, M3099GH or M3096G at each time you press [Mode 1] in case of M3099GH, and M3099G or M3096G at each time you press [Mode 1] in case of M3099GX.

㊴Press [Mode 2] to see Screen 26. The setting are stored to EEPROM.

㊵When you close the setup mode, go to ⑨.

B3.14   Setting picking start time

When you set the picking start time, you must set as follows.

```
<< SETUP MODE >>
- - - - - - - - - - - - - - - - - - - - - - -
PICK START TIMER
```

Screen 28

```
PICK START TIMER
- - - - - - - - - - - - - - - - - - - - - - -
X X . X   S
```
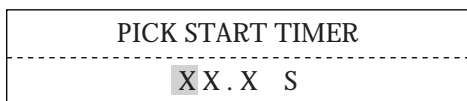
Screen 29

㊶At Screen 2, press [Mode 1] fourteen times to go to the PICK START TIME screen. (Screen 28)

㊷Press [Mode 2] to see Screen 29. (The default setting is 1 sec.)

㊸At Screen 29, press [Mode 1] until the digit you want to change blinks. Then press [Mode 2] until the digit changes as you want. (The specifiable range is from 0.2 to 29.8 sec. in 0.2 sec. step.)

㊹Press [Mode 1] and [Mode 2] at a time to see Screen 28. The settings are stored to EEPROM.

㊺When you close the setup mode, go to ⑨.

SETUP MODE

B3.15 Setting picking time

When you set the picking time, you must set as follows.

```
        << SETUP MODE >>
- - - - - - - - - - - - - - - - - - - - - - - - - -
          PICK TIMER
```
Screen 30

```
        << SETUP MODE >>
- - - - - - - - - - - - - - - - - - - - - - - - - -
          X X . X    S
```
Screen 31

㊻ At Screen 2, press [Mode 1] fifteen times to go to the PICK TIMER screen. (Screen 30)

㊼ Press [Mode 2] to see Screen 31. (The default setting is 2 sec.)

㊽ At Screen 31, press [Mode 1] until the digit you want to change blinks. Then press [Mode 2] until the digit changes as you want. (The specifiable range is from 0.5 to 99.5 sec. in 0.5 sec. step.)

㊾ Press [Mode 1] and [Mode 2] at a time to see Screen 30. The settings are stored to EEPROM.

㊿ When you close the setup mode, go to ⑨.

B3.16 Setting time-out limit

When you set the time-out limit, you must set as follows.

```
        << SETUP MODE >>
- - - - - - - - - - - - - - - - - - - - - - - - - -
          TIME-OUT SET
```
Screen 32

```
          TIME-OUT SET
- - - - - - - - - - - - - - - - - - - - - - - - - -
          X X X X    S
```
Screen 33

�51 At Screen 2, press [Mode 1] sixteen times to go to the TIME-OUT SET screen. (Screen 32)

�52 Press [Mode 2] to see Screen 33. (The default setting is 30 sec.)

�53 At Screen 33, press [Mode 1] until the digit you want to change blinks. Then press [Mode 2] until the digit changes as you want. (The specifiable range is from 1 to 1999 sec. in 1 sec. step.)

�54 Press [Mode 1] and [Mode 2] at a time to see Screen 32. The settings are stored to EEPROM.

�55 When you close the setup mode, go to ⑨.

B3.17 Setting hopper time

When you set the hopper time, you must set as follows.

```
<< SETUP MODE >>
- - - - - - - - - - - - - - - - - - - - - -
HOPPER TIMER
```
Screen 34

```
HOPPER TIMER
- - - - - - - - - - - - - - - - - - - - - -
X  X    S
```
Screen 35

㊺ At Screen 2, press [Mode 1] seventeen times to go to the HOPPER TIMER screen. (Screen 34)

㊼ Press [Mode 2] to see Screen 35. (The default setting is 7 sec.)

㊽ At Screen 35, press [Mode 1] until the digit you want to change blinks. Then press [Mode 2] until the digit changes as you want. (The specifiable range is from 0 to 30 sec. in 1 sec. step.)

㊾ Press [Mode 1] and [Mode 2] at a time to see Screen 34. The settings are stored to EEPROM.

㊿ When you close the setup mode, go to ⑨.

B3.18 Setting heater control

When you set the heater control, you must set as follows.

```
<< SETUP MODE >>
- - - - - - - - - - - - - - - - - - - - - -
HEATER CONTROL
```
Screen 36

```
HEATER CONTROL
- - - - - - - - - - - - - - - - - - - - - -
ON
```
Screen 37

� At Screen 2, press [Mode 1] eighteen times to go to the HEATER CONTROL screen. (Screen 36)

㉑ Press [Mode 2] to see Screen 37. If "ON" is displayed, the heater control will be done. If "OFF" is displayed, warming-up will finish within 30 sec. necessarily.
When the heater is broken, please set "OFF". The "ON" or "OFF" status flips each time you press [Mode 1]. The status will be set in EEPROM automatically.

㉒ If you want to return to Screen 36, press [Mode 2]. When you close the setup mode, go to ⑨.

C

SEPARATION PRESSURE ADJUSTMENT

Adjust the separation pressure as follows:

WARNING
Wait at least 3 minutes after turning off the power before replacement.

ACHTUNG
Warten Sie mindestens 3 Minuten nach Ausschalten, bevor Sie mit dem Austausch beginnen.
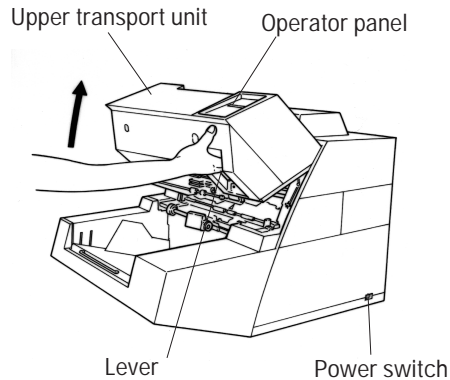
Upper transport unit   Operator panel

Lever   Power switch

① Turn off the power switch. Make sure that the hopper table is at the bottom.

② Open the upper transport unit. (See page 4-2)

Lever (green)
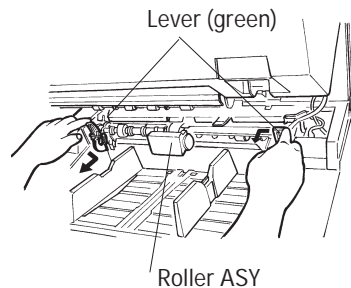
Roller ASY

③ Disconnect the two relay connectors on the roller ASY.

④ Push the two levers (green) towards each other to dis-engage with the upper locking holes and lower down the two levers until they engage with the two levers locking holes.

SEPARATION PRESSURE ADJUSTMENT
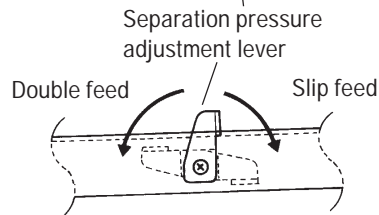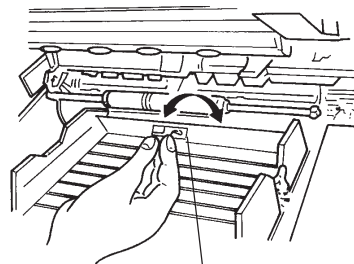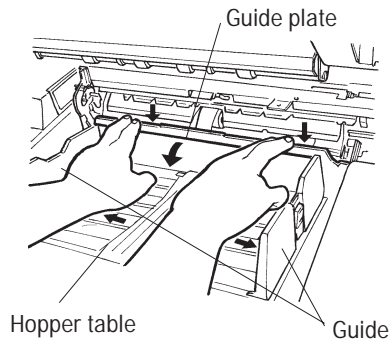
Guide plate

Hopper table

Guide

Separation pressure
adjustment lever

Double feed

Slip feed

⑤ Lift the document sensor unit and keep it at the upper position with one hand and pull the roller ASY out with the other hand.

⑥ Move the guide on the hopper table completely to the end.

⑦ Hold both ends of the guide plate and press them down to remove the guide.

⑧ Adjust the separation pressure by using the separation pressure adjustment lever according to paper feed error as follows:

• Slip feed:
Turn clockwise by 45°. (Increase the separation pressure.)

• Double feed:
Turn counter-clockwise by 45°. (Decrease the separation pressure.)

Notice:
If the paper feed error reccur, try this adjustment again until the lever stops.

Glossary of Terms

A4 size

A standard paper size used in Japan and other countries. Paper is 210 x 297 mm (8.25 x 11.6 inches).

ASCII

The acronym for American Standard Code for Information Interchange. ASCII is a set of 256 codes (numbered 0 to 255) used to communicate information between a computer and another device such as a scanner.

Automatic separation

The image processing method to detect the difference between text and photos and choose the thresholding accordingly. Automatic separation allows the scanner to switch between line mode and half tone mode in one pass.

Automatic start mode

A mode that the scanner starts to read by the command from the host machine.

Bit

The smallest unit of information in computer memory. A bit is a single digit, either a 1 or a 0, in the binary numbering system. Eight bits equal one byte.

Dither

Technique for producing halftone images representing the entire grayscale using two pixel levels black and white.

dpi

Dots per inch.

Endorser

The unit for printing characters before or after scanning. These characters may be used for collation of the documents and the image data. (See appendix A)

Equipment error

An error which the operator can not recover, such as optical system alarm, temperature alarm and so on. It is necessary to make contact manufacturer's authorized service center for paper repair service.

Error diffusion

High-quality halftone (pseudo-grayscale) image production base on black-and-white pixel binarization. A pixel's optical density and that of adjacent pixels are summed, with black pixels relocated in their order of density as they relate to adjacent pixels.

The purpose of this technique is to minimize the average error between readed and printed densities. Density data for adjacent pixels is modified by diffusing errors on the objective pixel into several pixels, which are than binarized. This maintains high grayscale levels and resolution during reading, while suppressing moire patterns by dotted halftone images such as newspaper photo graphs.

Filtering

The quality of images written in pencil or ballpoint pen and readed depends on the reflective light characteristics of the ink or lead. Dropped pixel's may produce out lines, gaps, or thin, barely connected lines due to even optical density. Filtering detects areas lighter than their surroundings and increases their density to improve image clarity.

Hexadecimal

A base-16 numbering system (also commonly referred to as hex numbers). Since a base-16 system requires 16 digits, numbers 0 through 9 and letters A through F are used. It is convenient to express binary numbers in hexadecimal because fewer digits are required.

Image emphasis

Density is decreased for lighter but not completely white areas adjacent to black areas. Weakening this emphasis eliminates spot noise or produces softened images.

Interface

The connection that allows communication from one part of a system to another. For example, electrical signals are transferred between the computer and scanner over an interface cable.

Inversion (Reverse-image reading)

In reverse-image reading, data is changed from black to white and vice versa.

IPC II

Image processing option of this scanner.

Letter size

A standard paper size used in the U.S.A. and other countries. Paper is 8-1/2 x 11 inches (215.9 x 279.4 mm).

Manual mode

A mode that the operator can put the document on the hopper one by one. A document on the hopper can be read automatically.

Manual start mode

A mode that the scanner starts to read by pressing the "START" button on the operator panel.

Mirror image

The reaeded image is symmetrically flipped to produce a mirror image of the original detected in the main scanning direction.

Noise removal

Isolated noise from an image appearing as black spots in white areas and voids in black areas is removed to improve image quality.

Operator panel

A panel containing the scanner indicators and buttons. The operator panel is used to control scanner operations such as loading document selecting features, and changing setup options.

Outline extraction

The boundary between black and white areas is traced and the outline extracted for closed areas.

RS-232C interface

A type of serial interface. See Serial interface.

Serial interface

A standard computer interface. Information is transferred between devices over a single wire (although other wires are used for control). With a serial interface, an interface cable greater than 3 meters (10 feet) can be used. This is often necessary in networking environments, where the scanner may be shared.

Smoothing

Smoothing eliminates jaggies from slanted lines and curves. Irregular convexities are deleted and irregular concavities filled in. This is useful in OCR applications, for example.

Temporary error

A status which the operator can recover, such as paper jam, hopper empty, cover open, pick miss.

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